THE OIL WEEKLY

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The Oil Man's Calendar

AUG. 1– 6	**The Eastern United States Michigan Oil & Gas Exposition, Mt. Pleasant, Michigan.**
SEPT. 4– 8	**American Society of Mechanical Engineers, New York.**
5	**Oil Workers International Union, Hammond, Ind.**
11–15	**American Chemical Society, Boston, Mass.**
13–15	**National Petroleum Association, Atlantic City, N. J.**
OCT. 4– 6	**American Institute of Mining & Metallurgical Engineers, Petroleum Division, Galveston, Texas.**
5– 7	**Texas Mid-Continent Oil & Gas Association, Houston, Texas.**
9–10	**American Gas Association Annual Convention, New York.**
16–20	**National Safety Congress, Atlantic City, N. J.**
18–20	**Independent Petroleum Association of America, Fort Worth, Texas.**
19–20	**A. I. M. E. Petroleum Division, Los Angeles.**
NOV. 13–17	**American Petroleum Institute, Stevens Hotel, Chicago.**
15–17	**American Institute of Chemical Engineers, Providence, R. I.**
DEC. 4– 7	**American Society of Mechanical Engineers, Philadelphia.**
APR. 11–12	**American Petroleum Institute, Eastern District, Division of Production, Columbus, Ohio.**

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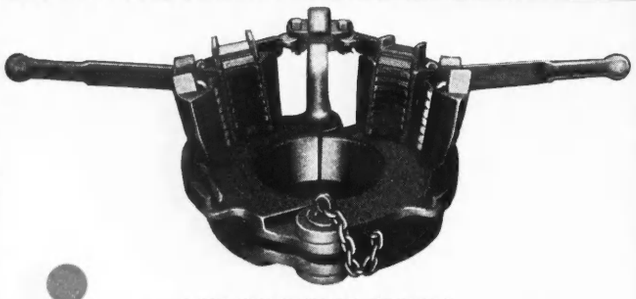

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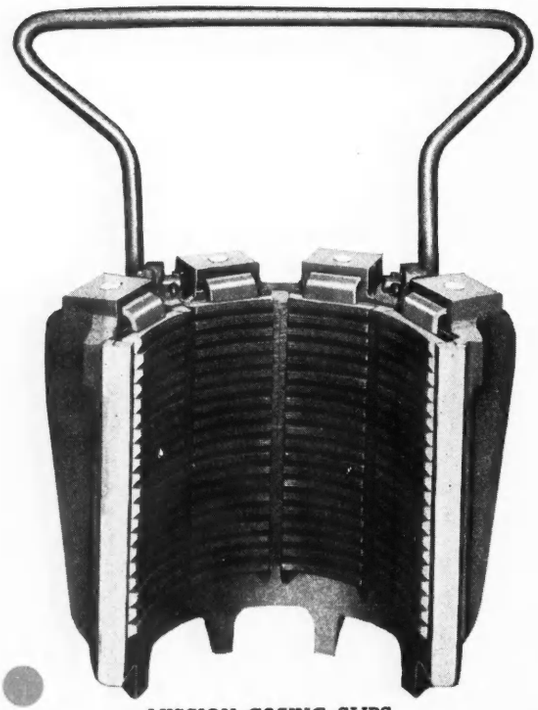

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This Week's Panorama

Federal Control Nearer Than Ever Before

The petroleum industry is nearer federal regulation now than ever before in its history. A new oil control bill was introduced in Congress last week, after President Roosevelt had urged the adoption of such a measure in a message to the chairman of the Interstate Commerce Committee on July 25, and conditions are believed to be more favorable for the passage of such legislation today than when previous attempts were made. [Details of the bill appear in the news section of this issue.]

The president's letter stated that despite the progress made toward oil conservation under state law and regulation, the production of petroleum still is attended by waste, and that prevention of this situation was necessary because of the vital part petroleum plays in national defense, commerce and industry. These same conditions also are outlined in the bill.

Would Create Federal Conservation Department

The bill would establish a petroleum conservation office in the Department of Interior that would be under direction of a commissioner appointed by the president. It would be the duty of the commissioner to regulate all oil and gas fields where state agencies were permitting avoidable waste to occur. A survey of all fields would be made, in which spacing, drilling, completion and producing practices would be considered, along with such reservoir conditions as porosity, permeability, gas/oil ratio, bottom-hole pressure trend, water encroachment and other factors. If waste is found to be occurring, federal regulations would be issued to prevent such conditions.

There also would be established an 18-member council, nine state officials, six oil men, and three petroleum professors.

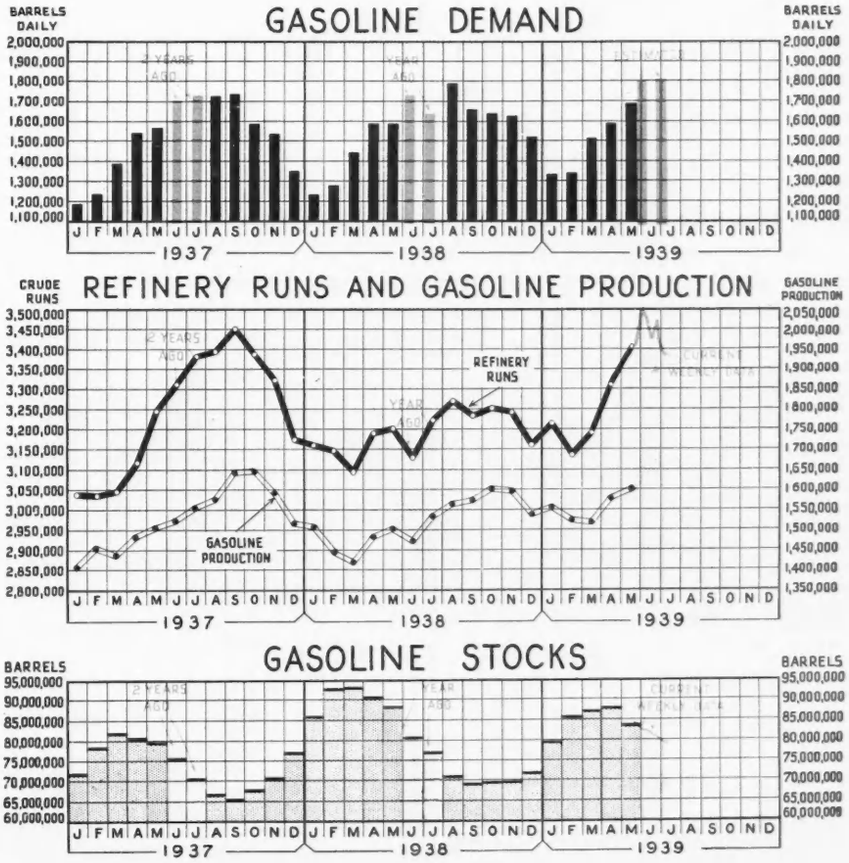
Bill Would Give States Chance to Regulate

The proposed measure does not appear drastic, since it gives states the chance to regulate all or part of their production before federal rules would be issued, but it is an opening wedge toward eventual complete federal control. Moreover, it would give the federal government power to regulate intrastate activities for the first time.

There is no plan to hurry the bill through the present session of Congress, but it is expected to be one of the major considerations when congressmen convene next winter. Meanwhile, it is anticipated that

Accelerated Gasoline Stock Reduction Continues

Storage is reduced 1,456,000 barrels in week ended July 22 despite slight increase in runs to stills and gasoline production.



exhaustive hearings will be held during the summer recess.

It is expected that the bill will be bitterly fought by the industry. However, it is possible that there will be less opposition now than in the past, as some oil men are known to be leaning more toward federal regulation because the states have not been able to cooperate among themselves.

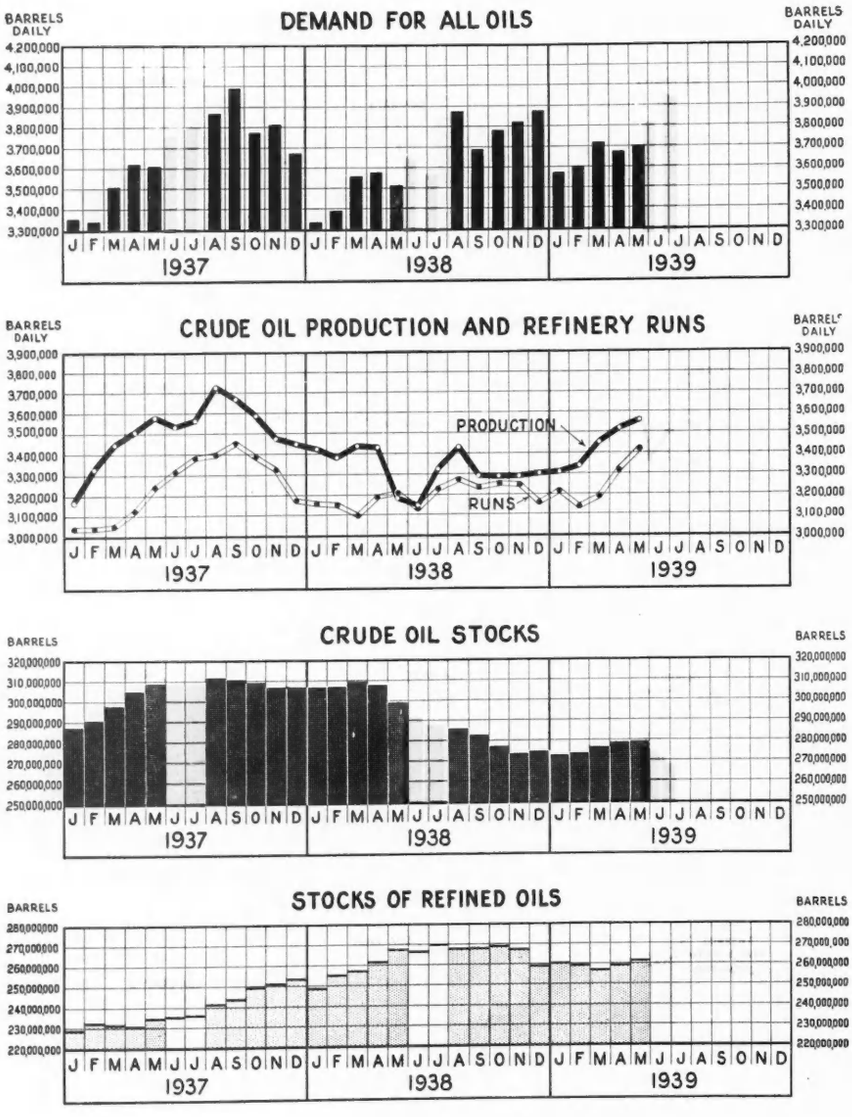
Industry Brings Control Upon Itself

If federal control comes to the industry, oil men will have no one to blame but themselves. Of course, the politicians recognize the vital necessity of oil and that the country is producing amounts vastly exceeding those of any other nation, but to a very large extent conditions in the industry itself are factors encouraging federal regulation.

The Louisiana oil probe, which reached the federal grand jury stage last week, is one of the contributing influences. For nearly two years, there have been recurrent rumors that the Louisiana situation was unsatisfactory, and recently there have been charges of widespread corruption. The federal government has sent investigators to look into matters.

Crude Stocks Drop Despite Increased Production

New 17-year low level attained as 1,149,000 barrels of crude withdrawn during week ended July 22 despite an increase in well output.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STOCKS OF REFINED OILS
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1939

There has been much comment on making too much gasoline, with the result that excessive stocks depressed prices, but the industry did nothing to correct the condition.

Likewise, much blame was placed upon Illinois for not passing an oil conservation measure — but again nothing was done. In fact, operators in Illinois were divided on the subject. Now they may have control, whether they like it or not.

It is situations like this that will bring control to the industry as rapidly as the general public's idea of waste in the business.

Louisiana Corruption Probe Is Intensified

John Rogge, in charge of the Department of Justice's criminal division who is directing the federal investigation of corruption in Louisiana's oil business, has sent additional investigators to the scene. Rogge declared they were going to trace down "scores of leads" and "we mean business."

Meanwhile, a federal grand jury at New Orleans was listening to the testimony of several leading politicians, and there was another shift in the head of Louisiana's conservation department. William G. Rankin, who refused to open his books for scrutiny, was removed as head of the department. At the same time, J. A. Shaw, who was removed as head of the conservation department's mineral division last week, was reinstated.

A federal grand jury at Shreveport was expected to start delving into the "hot oil" situation in North Louisiana about September 1.

High Gasoline Stock Withdrawals Continue

Most encouraging last week was the continuation of the accelerated rate at which gasoline stocks are being reduced. For the second consecutive week, major volumes were taken from this type of fuel in storage. The reduction of 1,456,000 barrels during the week ended July 22 brought gasoline inventories down to 77,960,000 barrels, and compared with a decrease of 1,407,000 barrels the preceding week.

The reduction in gasoline stocks came despite a small gain in refinery runs and gasoline production. At the same time crude stocks dropped 1,149,000 barrels to a new 17-year low of 264,486,000 barrels, although production was up 54,050 barrels daily.

Ramsey Proving Value of Unit Development of Small Pool

By BEN ALTMAN, Staff Writer

INFLUENCES of unit development are going into the records of the Ramsey field, the small but prolific Wilcox sand pool in Payne County and Oklahoma's top-ranking discovery since Fitts.

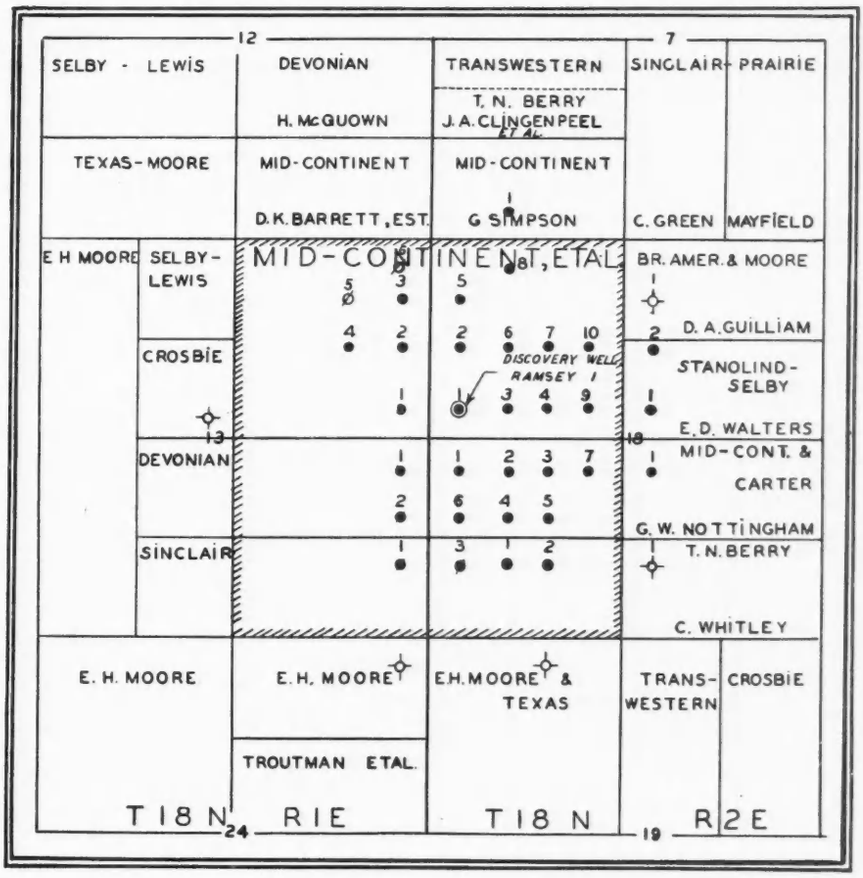
One of these is long flowing life. After 18 months, reservoir energy has registered no appreciable drop. Meanwhile in excess of 1,000,000 barrels, perhaps a sixth of its ultimate recovery, have been taken from the structure. Its 31 wells have aggregate potential higher than 250,000 barrels but daily output never has reached 5,000 barrels. This flow restriction matches engineering data calculated to get full advantage of reservoir energy, since the field was until June 1 not under proration orders of the Oklahoma Corporation Commission.

The order of June 1 set 4500 barrels daily for Ramsey. At that time, however, the field with 28 flowing wells was being held to 150 barrels per well of 4,200 barrels daily.

On both the south and west sides dry holes have been drilled one location outside the community block of 640 acres. Of the four wells producing outside the block, one on the north and one on the east were drilled by Mid-Continent Petroleum Corporation, which operates the community block. The effect of this is that the field has had a production program on community basis although two producing wells are beyond its boundary and under other ownership.

Thus it has been possible to maintain a drilling program in keeping with the production schedule. The field has perhaps 20 additional wells to be drilled, most of which will be on the community block. There is a dry hole a half mile north of production, which indicates that production outside the block in that direction will be under management of the company responsible for operation within the community property. This indicates that drilling will be completed without the necessity of giving attention to offset requirements.

A schedule for the remainder of well requirements in keeping with the schedule of development to

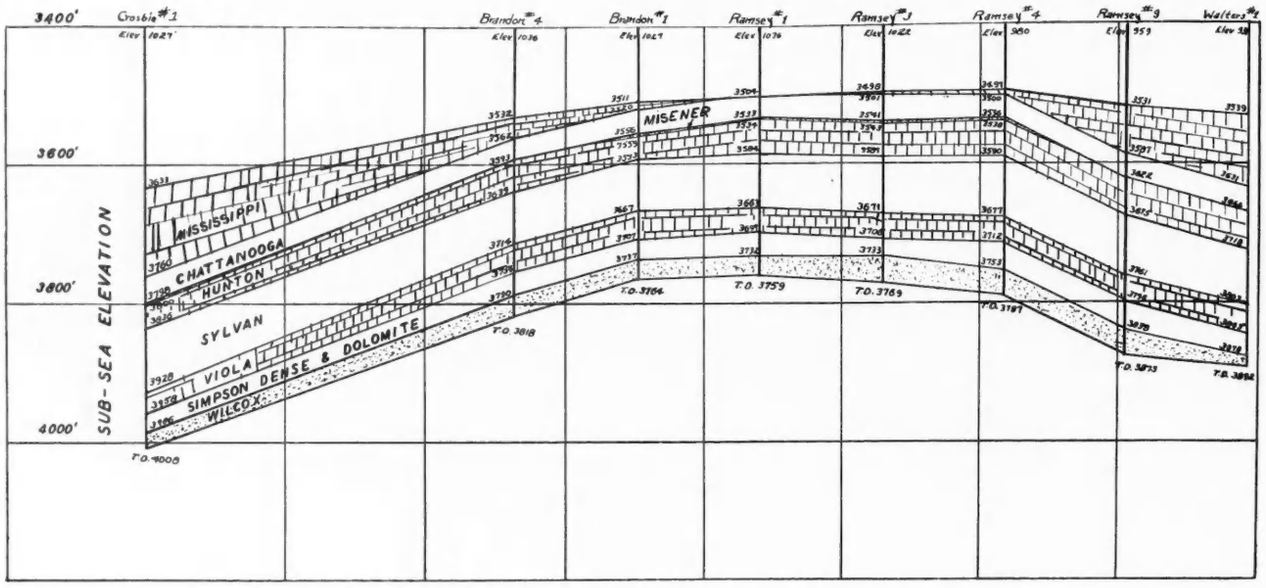


MINIMUM drilling requirement of 50 wells is indicated for the Ramsey field. No further drilling is justified to the east where three wells are producing but one location east of the line of the community block. Position of these on structure plus dry holes north and south of them are a boundary. Dry holes a quarter of a mile south of the four producers on this end of the field leave it unlikely that more drilling will be done in this direction.

The three latest completions in the field form the southwest corner of production. High initial output leaves it possible that this corner may be extended. The western limit will be found within the half mile between existing production and the dry hole just one location outside the community block.

It is to the north and northwest that development may enlarge the field so it will require more than 50 wells.

Whatever the final drilling requirement, it is evident that the productive area will not extend far beyond the 640 acres put into the community block and developed by Mid-Continent Petroleum Corporation.



date will require another year to provide the additional 20 wells. This 20-well figure is only an estimate. The three most recent completions form the southwest corner of production. Their initial output and position on structure gave assurance of additional drilling to the west and left it possible that there may be additional production to the south. Present drilling is to test extent of production to the northwest.

A reserve figure for the field is impossible to calculate, since saturated Hunton lime was found in cores from most producing wells. It is likely that this formation will be drawn upon later, possibly by plugging back after depletion of the First Wilcox sand. Some wells also had saturation in the Simpson dolomite. The field also has a well saturated zone of Misener sand but its thickness was never more than 3 feet.

Output of these formations will be in addition to what will be taken from 30 feet of the First Wilcox sand. The lower 20 feet of this formation is highly saturated.

Geophysical Discovery

Geophysical exploration was responsible for drilling the discovery well, Ramsey 1, SWc NW 18-18n-2e. It had top of the First Wilcox sand at 4768 feet and drilled to 4795 feet. It began flowing January 2, 1938, and was completed 10 days later for potential rating of 13,344 barrels.

Only 640 acres were put into the community block, 75 percent owned by Mid-Continent Petroleum Corporation, 12.6 percent by Carter Oil Company and 6.2 percent for both Transwestern Oil Company and Sinclair Prairie Oil Company.

STRUCTURALLY the Ramsey field is a small dome with steep dip in all directions, a condition most pronounced to the south and southeast. Dip is as much as 260 feet.

The structure was found by seismograph exploration and so accurately outlined that the first well was drilled on the crest of the structure. It was void of Mississippi lime. Later drilling found this lime absent in Wetzel 2, NE NW SW 18-18n-2e, highest well on the Viola lime and considered highest on structure. An east offset, Wetzel 3, NW NE SW 18-18n-2e, proved to be highest on the Wilcox sand, with Mississippi lime absent.

Production is from First Wilcox sand, whose top ranges from 4730 to 4800 feet from the surface. Its average thickness is 30 feet, with the lower 20 feet highly saturated. The Hunton lime showed saturation in so many wells that there is a possibility of producing it later by perforations. Most wells also had a saturated Misener sand but this was never thicker than 3 feet. A few cores revealed saturation in the Simpson dolomite.

A shale bed, 2 feet thick, immediately above the Wilcox sand serves as a barrier to confine oil within the reservoir.

High potentials on wells low on structure were confusing in early development. This is accounted for by variation in permeability of the sand, ranging from zero to 275 millidarcies. Porosity of the Wilcox sand varies from 9.5 to 22 percent. Bottom-hole pressure of the discovery well was 2038 pounds. So far decline in pressure has been negligible. Bottom-hole temperature is uniform for the field, 130° F. No free gas exists in the reservoir. Gravity of the oil is from 42 to 43, corrected.

Three producing wells and two dry holes have been completed along the east line and outside of the block and indications are that no further drilling will be done in this direction. With dry holes south of the block and one to the west, only the area north of the block offers the possibility of further enlargement beyond the community block. A dry hole, not shown on the accompanying map, is a half mile and one location west of the one producer on the Simpson tract.

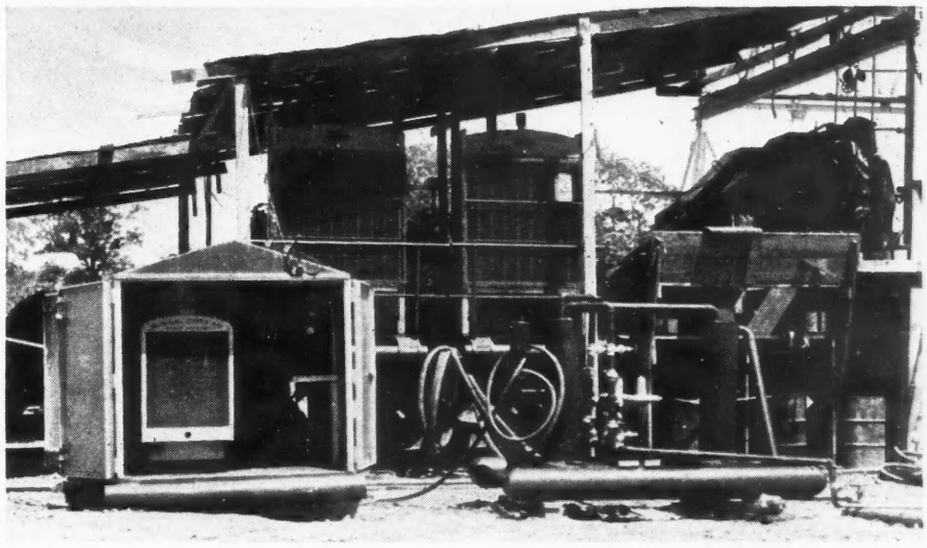
Drilling Practice

Drilling at Ramsey requires 30 days. Hard formation bits are used the full distance to top of the producing formation, which is penetrated by core barrel.

Common practice is to drill 15-inch hole for the 13-inch, 45-pound surface pipe, set from 900 to 950 feet and cemented to the surface. Then 9-inch hole is carried into the Viola lime, near top of the First Wilcox sand and the 7-inch oil string cemented to the bottom of the surface string.

Both internal combustion engines and steam rigs are used. Gas fuel serves either type. Internal combustion power calls for two 300-horsepower motors. While drilling, one drives the rotary table and the other maintains pump pressure. For hoisting the two can be used in tandem.

Within the proven area concrete floor, level with the surface, and concrete cellar are run previous to drilling. A sub structure 7 feet high is then set on this concrete base and the rig floor placed at



Auxiliary equipment for drilling rigs used at Ramsey.

this level; the derrick height is 122 feet. Derricks are left for future well servicing.

Auxiliary equipment for internal combustion-powered rigs consists of a combination generating plant and air compressor, housed on skids, and a gas scrubber unit, whose construction provides its own skids. The air compressor and electric generator are driven by one gas engine through clutch and V belts. Gas fuel comes to the scrubber at field pressure and is stepped down by regulators on this unit. The scrubber consists of two horizontal pipe sections and two upright chambers. Oil is used as the scrubbing medium.

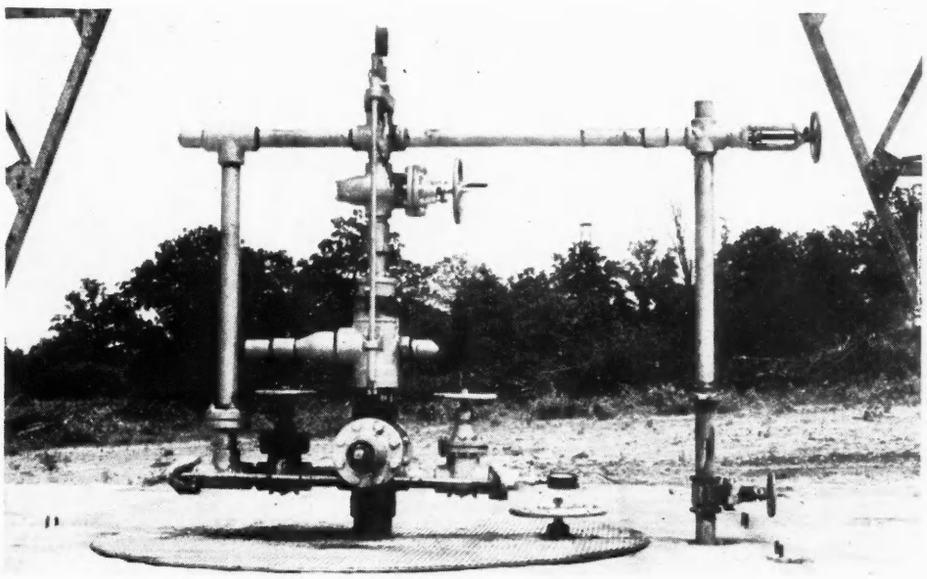
Completion method for Ramsey wells is by washing in through casing. After the sand has been cored, tubing is swung into the upper part of the Wilcox sand. The Christmas tree assembly is in partly completed stage with the valve above the tubing head in place so water can be introduced and mud washed out through the annular space between tubing and 7-inch casing.

Water is used until mud is removed. Then oil is used to lighten the load and give formation pressure opportunity to bring natural flow. The discharge continues into the pit until the well shows evidence of flowing when this line is closed and the valve on another line at right angles to the casing and below the derrick floor is opened. This line is to the separator. When satisfactory flow has been established, the valve on the tubing above the tubing head is closed and the Christmas tree completed.

Flow line for discharge through the casing is 4-inch pipe with control bean set in a right angle turn, where the line assembly is taken downward through the derrick floor and then to the separator. With this in place, flow through casing is halted and the well put under its desired gas/oil ratio. Both vertical and horizontal tie rods are used in all assemblies.

Casing pressures at Ramsey average 550 pounds and tubing pressures average 440 pounds.

Remote controls are left beyond the derrick floor for the master gate on the casing below the derrick floor.



A completed well at Ramsey.

Pumping Series Article No. 15

Pumping Lease Worker Safer On Than Away from Job

Record of a million consecutive man hours without a disabling accident is no longer a rarity . . . Organized safety responsible.

By HENRY W. BOGGESS,
Superintendent of Safety,
Sinclair Prairie Oil Company

TODAY, lease operation work has become a safe occupation. The roustabout and the pumper on a modern oil field lease are safer at work than away from work. It is a rare exception when today's roustabout or pumper sustains more than a skinned knuckle on the job. More than one oil producing company has chalked up a record of a million consecutive man hours of work without a disabling injury. Considering the potential hazards, the many possibilities of personal injury incident to a rod pulling job, a tubing job, the overhauling of a 40-horsepower engine, or any one of dozens of ordinary lease occupations, such accomplishments as one million hours without disabling injury bears testimony to the effectiveness of organized safety in oil production.

It goes without saying that the tremendous reduction in accidents has been humane, but it also has been profitable. Dollars have been developed for capital by lower insurance rates, and for the worker by full-time pay.

It has not been so very long since routine tasks incident to lease operations produced accidental injuries with such frequency that today's safety conscious workmen would be shocked in retrospection.

Most old-timers in the oil producing business bear the scars of early day lease hazards. The now simple and safe act of hooking-on and hooking-off pull rod lines was once a source of serious hand injuries. That was before simple hand-holds were welded to "C" links and knock-off blocks; long before mechanical knock-offs were visioned. Missing fingers on the hands of many early day roustabouts and pumpers can be attributed to falling polished rod clamps. Adherence to proper routine and also the installation of modern type stuffing boxes that can be packed while the polished rod is in motion, has minimized this hazard. Babbitt popping from a bearing job has cost the eyes of many oil field workers. Preheating of metal and the use of flake asbestos has just about eliminated old time moisture popping. Even the necessity for rebabbitting jobs has been eliminated by some operators by the use of a thermo safety device which automatically shuts down an engine when the temperature of bearings reaches a predetermined degree. Not only does such a device save costly rebabbitting jobs, save the loss of production and eliminate hazards incident thereto, it also does away with the necessity of pumpers placing their hands over journals to determine bearing temperatures and therefore dispenses with the possibility of injuries from contacting flywheel spokes.

Before the advent of organized safety in the oil fields, it was not an uncommon occurrence for a farm boss to report injuries due to nail punctures, to report the falls of employees because of stumbling hazards, or to report more serious falls from old type chicken ladders so common on Sampson posts. Most leases, then as now, were equipped with emery wheels, some of them run by steam, but no one seemed to think of side flange-plates to prevent cracked wheels (often run too fast with steam) from literally exploding. Nor did anyone seem to consider it necessary to protect human eyes with goggles or flexible-arm and shatter-proof glass shields. In those days, when farm bosses rode the buckboard, it was little wonder that tetanus, gas bacillus and other serious infections followed in the wake of nail punctures, abrasions and cuts and all too frequently resulted in amputations, if not in burials. So far as the oil fields were concerned, first aid was then something known to doctors only, and hours intervened between the occurrence of an injury and the time it took to get an injured man from the lease to the nearest doctor's office. Little wonder that bones were cracked, eyes impaired, hands lost or that Employer's Liability (later Workmen's Compensation) insurance rates constantly mounted higher and higher.

The progress of oil field safety since about 1923 has been so continuous and so effective that today the true picture of 1910, even 1920, seems fantastic. Imagine a tubing board man wearing a safety belt in 1915! Imagine a company trying to put a man on a tubing board

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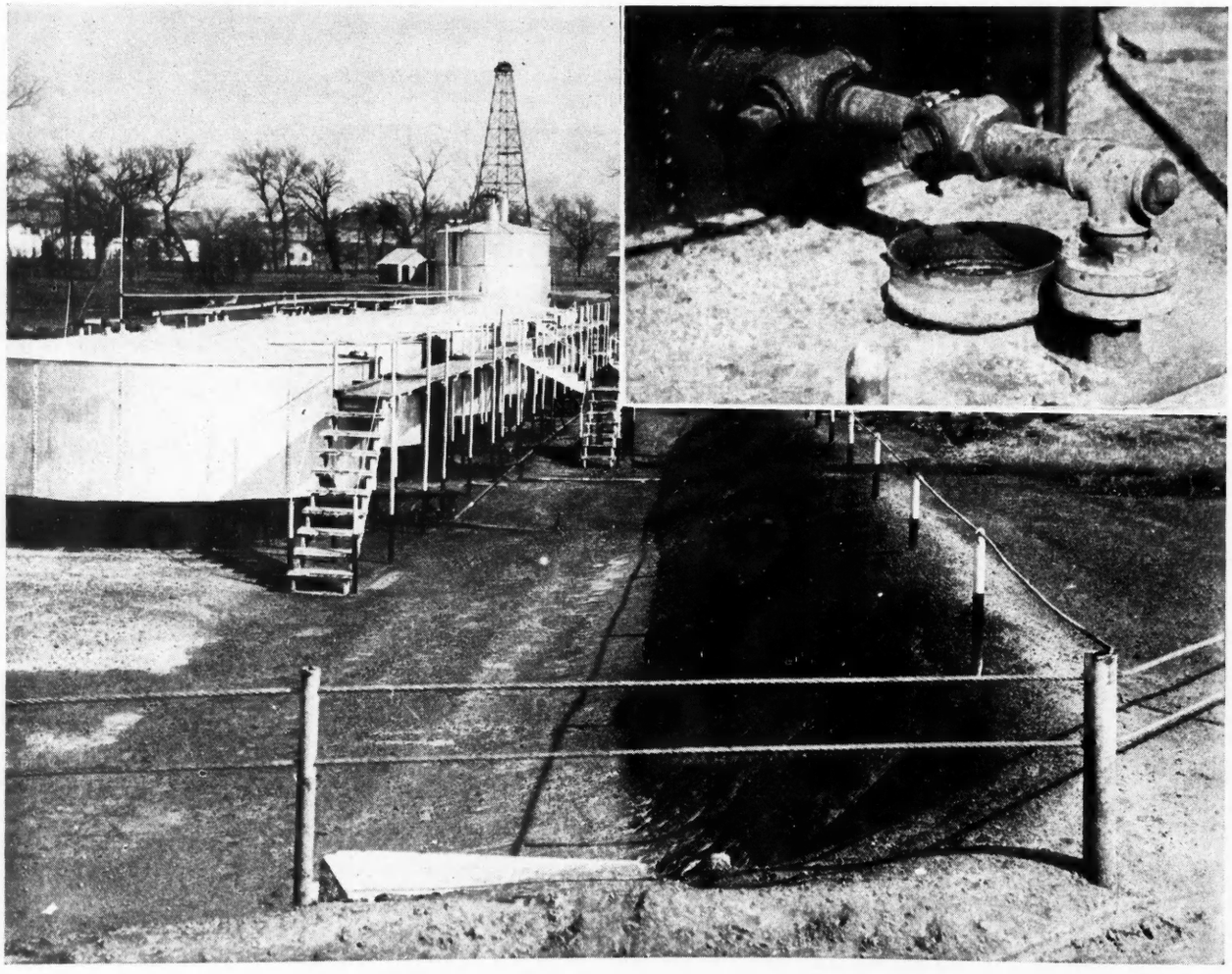
without a belt in 1939! Since those old days when gasoline buggies were coming into vogue and daily increasing the demand for products of petroleum, the old unguarded hooks, the unguarded belts and flywheels and clutches and governors and counter balances and couplings and shafts and open cogs, have just about gone the route of the buggy whip and the hobble skirt.

In 1920, the average accident frequency in lease operation work is estimated to have been approximately 87 disabling injuries per million hours of work. Today that frequency is approximately 12 disabling injuries per million hours. In less than one score of years the frequency of lease operation accidents has decreased approximately 85 percent.

Translating this reduction into terms of human lives and limbs that have been saved, into terms of dollars actually used for wages, dividends and business expansion instead of regrettable funerals and costly damage suits, might be considered conjecture and hence fail to conform to pet formulas for such calculation. Be that as it may, any yardstick the individualist may care to employ will measure material profits for both capital and labor, for both dollars and men which will show to the everlasting credit of safety.

The man who would have dared to predict an 85-percent reduction in lease operation accidents in 1920 would not have been given serious consideration by any practical operator. The National Safety Council had then been organized but seven years and, while it was conceded in some quarters that a limited control of accidents could be exercised in plant operations (where employees were grouped in large numbers), the possibility of getting results in scattered units of field operation was given scant, if any, consideration.

Accomplishments in safety in the operation of oil field leases emanate from several sources. First on the list should be the operating executive whose vision of the possibilities of safety in terms of benefits to himself and his men led him to finance the experiment. Next on the list should be classed the accident preventionist—the safety engineer. It was this specialist who first subjected accident reports to analytical scrutiny, who delved into fundamental and contributing accident causes and who emerged with scientific and practical ways and means of controlling those causes. It was he whose task it became to convince management and to convince workmen that accidents and resultant injuries would diminish in proportion to their cooperative efforts to minimize them. It was he whose business it became to en-



A 10-year-old picture of a tank battery in Seminole. The company owning this lease has enjoyed a good accident experience there since discovery of the field. The reason that oil puddles do not show around the tanks is shown in the inset.

LIGHT, COMPACT, DEPENDABLE..

... *thanks to* NICKEL!

With only 3 moving parts, this Reed rotary engine combines the high starting torque of reciprocating engines with the vibrationless performance of a turbine. A blade replaces the conventional piston, making space between outer casing and rotor serve as a cylinder. Nickel alloyed cast irons maintain close clearances.

High power-weight ratio calls for exceptional strength in components

BY UTILIZING high steam pressures and superheat temperatures, the Reed "Type 101" rotary engine develops unusual power. Yet this engine is sufficiently light and compact for portable use.

For practically every part, the makers, Reed Roller Bit Co., Houston, assure ample strength and resistance to heat through the use of Nickel alloy cast iron having a tensile strength exceeding 55,000 p.s.i. This heat treated Nickel-chromium-molybdenum iron combines good wear resistance and low growth tendencies at elevated temperatures. Close, uniform grain structure maintains pressure tightness, permits easy machinability.

Wherever metals must combat wear, strain, heat, cold or corrosion you can usually save delays — and money — by specifying alloys containing Nickel. For complete information on any specific materials problem, you are invited to address your inquiry to:

CAST NICKEL IRONS

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

To insure against pulling in a derrick, all corner posts should be level, relegging should be done properly, and horizontal stresses avoided.

gineer methods, routines and processes; to choose and design, at least to advocate and suggest tools and equipment that would prevent recurrences of sad, costly mishaps. It was he who taught the guarding of mechanical hazards and the use of personal protective equipment. It was he who argued that safety was an operating problem, the proper handling of which was as much good business as good ethics.

Gradually, as safety policies became operating policies and as safety techniques become more the vogue and less the novelty, as workmen become less disposed to resist change, hence more safety conscious and less accident prone, the manufacturers of oil field machines, tools and equipment responded with improvements in design and with increased factors in safety. True, the manufacturer's job is not yet complete, nor is the job of the executive, the safety engineer, the supervisor and the workman. All of them will have an assignment in safety so long as preventable accidents and injuries continue to arise out of the course of lease operation work. Of the 15 that remain of the original 100 injuries of 19 or 20 years ago, 85 percent are still preventable! It seems evident that the tough fight was not in eliminating the first 85—it will be in holding the ground that has been gained while making noteworthy progress in reducing those that still remain.

As an irreducible accident frequency rate (whatever that low point may be) is more nearly approached, accident prevention work must become more scientific, more technical and less general. Unless it does, the future may show little if any improvement.

Reduction of a high percentage of preventable accidents was obtained readily in the early days of organized safety by the adoption and application of an educational policy. For instance, *lack of knowledge* is an accident cause curable by education plus the acceptance of supervisory responsibility through the giving of proper instructions and subsequent check-ups to determine that instructions were understood and carried out. *Inattention* is an accident cause that has been much less noticeable as hours of work have been reduced, fatigue eliminated and as the proper placement of men has become more and more a duty of foremanship. *Horse-play* is a definite accident cause that has diminished in proportion to the effectiveness of safety education and the consequent growth of safety consciousness on the job. A *bravery complex*, growing out of an inflated ego, is a vicious accident cause that has been offset by job pride, team work and the desire to establish noteworthy safety records. Such accident causes as these are elemental and require but little effort to prevent.

Tougher problems are faced when accident causes originating in *improper work practices, dangerous routines, unsafe tools, hazardous equipment* and *unguarded machinery* are tackled. It is here that job analy-

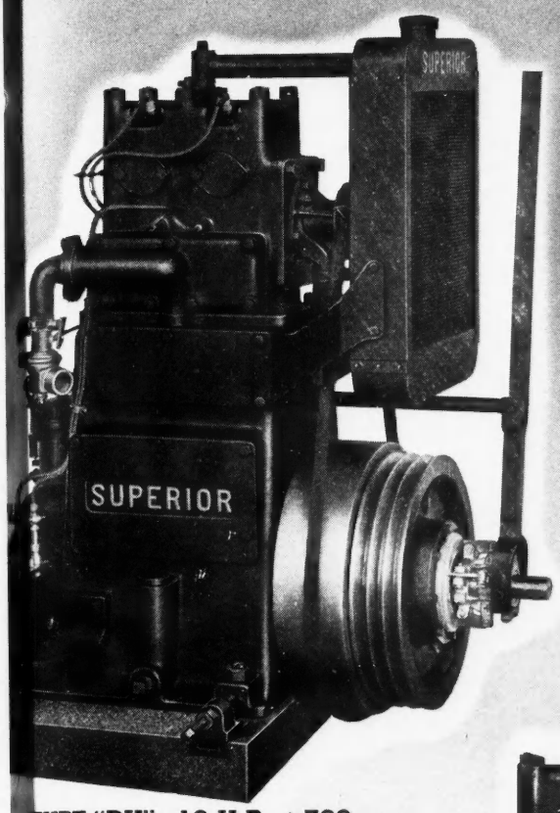
Such chaos as this, which existed 10 years ago, is seldom seen today. Then it would have been difficult to walk around an installation like this without incurring an accident.

Superior VERTICAL

2-Cycle Pumping Engines

THE SUPERIOR Vertical 2-Cycle Pumping Engines require so little attention that the pumper looks after more wells with less effort. Made so simple that any pumper can qualify to handle and adjust. Less than half as many parts as 4-cylinder high-speed engines.

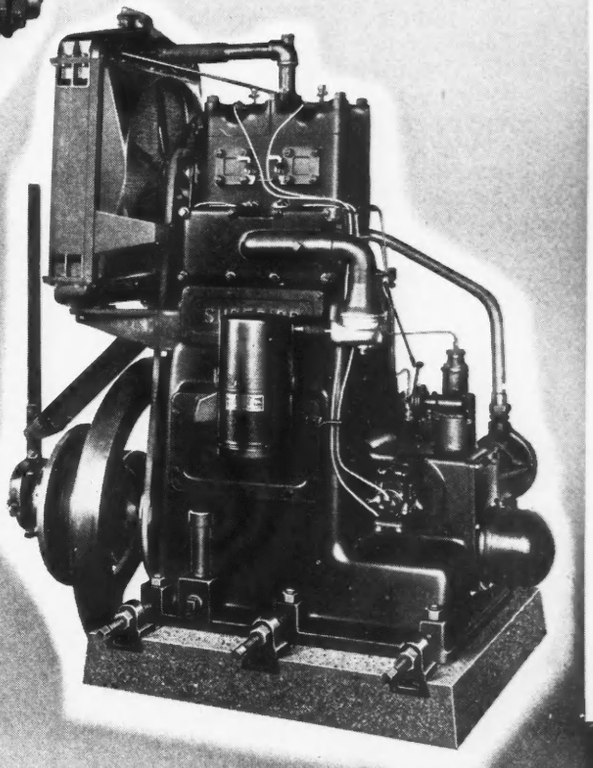
Massive construction—crank in roller bearings—crosshead to prevent cylinder wear—all bearings in a bath of oil—complete enclosure yet ready access through man size inspection plates—easy starting in any climate—rated conservatively for continuous service.



TYPE "DV"—10 H.P. at 700 rpm; 5.7 H.P. at 400 rpm.

Complete with water pump, radiator and clutch . . . For mounting on pumper beams (or concrete) ...For outdoor service.

TYPE "E"—20 H.P. at 700 rpm; 8.5 H.P. at 300 rpm.



TYPE "FB"—30 H.P. at 600 rpm; 20 H.P. at 400 rpm.

NSCO

The shield that symbolizes dependable equipment.

The Superior line of medium-speed vertical engines is complete from smallest single well pumper up to largest geared power. Additional sizes are: Type "GB" 50, 75 and 100 H.P.; Type "M" 160 and 240 H.P.

NATIONAL

THE NATIONAL SUPPLY COMPANY

EXECUTIVE OFFICES: PITTSBURGH, PA.
GENERAL SALES OFFICE: TOLEDO, OHIO

DIVISION OFFICES: FT. WORTH, TEXAS; TULSA, OKLA.; TORRANCE, CALIF.

Note the two stringer ladder with steel loop at top on this well guarded individual pumping unit in East Texas. Contrast the neatness of it and the one below with that on the preceding page.

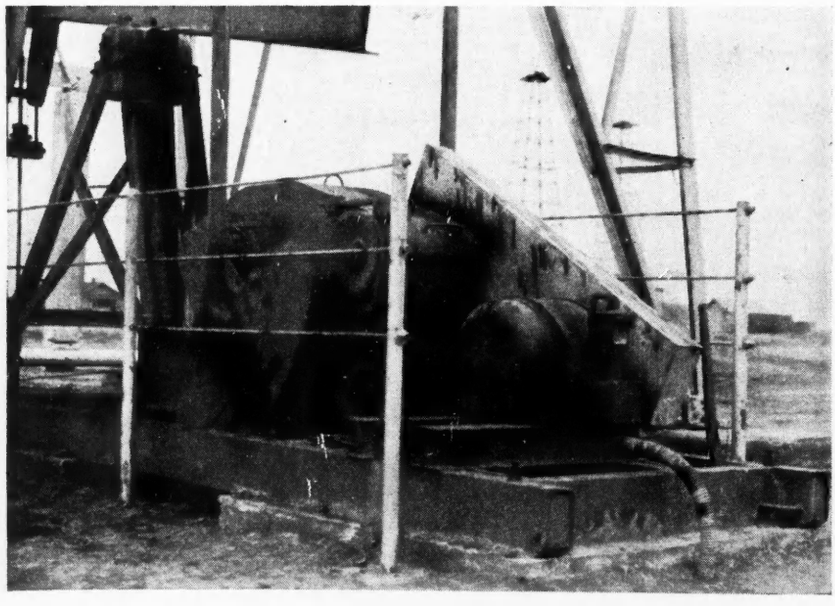
ses, the unqualified acceptance of supervisory responsibility and the unstinted cooperation of manufacturers are essential to success. Naturally, company policy will guide the safety engineer and the supervisor, yet to no little extent will the success of their efforts depend upon the manufacturer.

If a noteworthy portion of lease operation accident causes that still exist are to be relegated to the limbo of forgotten things, the manufacturer will play a leading role in banishing them. Students of accident causes have long known the specific responsibilities that should be assumed by manufacturers. Only recently some of the industry's leading engineers publicly advocated that manufacturers give specific attention to certain prevailing mechanical and equipment hazards. Those engineers comprise the A.P.I. committee on Safeguarding Oil Field Equipment. Included among 22 citations are recommendations that manufacturers (a) equip all Sampson posts with standard steel two stringer ladders with steel loops connected at the tops so that pumpers might climb in safety and also have support on which to lean while inspecting bearings; (b) install on all pumping equipment force feed lubrication systems with fittings at bases of posts, or other ground working level, to minimize climbing and eliminate walking on beams; (c) equip all small pumping units with Sampson post guards designed to block pumpers' passage under the moving beams of such small, low units; (d) provide screen panel guards around all cranks, same to have rigid base connections and (e) equip all V-belt drives and pulleys with solid metal cover guards having sliding or hinged windows for inspection purposes.

Other recommendations of this committee include special construction of steel cranks so that they will automatically disengage when not being operated; dependable safety locks on rod hanger grips; the provision of a more dependable method of bolting crown blocks to derricks; bearing caps locking all sheave trunnions; the provision of a means (possible set screws) of locking bearings so they will not stick to sheaves; built-in device that will permit clamping of bearing box to crown block beam; effective metal guards for traveling blocks; railing guards for back cranks; metal covers for roller "hold-up" and "hold-downs" and others.

The trend of the times points to great technical progress in petroleum safety, and certainly to the fact that prevailing lease operation accident causes now existing will be viciously attacked from here on out. This is as it should be. After all, the wealth of experience that 15 years of organized petroleum safety makes available is ample to work wonders.

Whether in pipe line, in drilling, in manufacturing, in marketing or in lease operation, it is evident that the growth of safety in the petroleum industry has been as swift and as profitable as it has been humane. Safety has grown from practically naught to its present position where it protects not only life and limb but, as well, the pocketbooks of workers and sometimes even the solvency of firms that furnish jobs. Modern industrial safety is truly economic humanitarianism.



Good safety practice is evidenced in this electric pumping unit near Garber, Oklahoma. It would be difficult to experience more than a bruised shin at this installation.

YOU ARE *NOW* PROTECTED!

.. Using 1 Tool to replace 2*

—FOR DRILLING IN WITH OIL

The Federal Court removes an obstacle from the path of drilling economy. Now, for the first time, you can drill in under pressure *with a single tool*, which (1) holds pressure, (2) rotates with the drill stem, (3) is the only oil saver needed.

The GUIBERSON Drilling Head, Rotating Blow-Out Preventer and Stripper, makes it possible for the operator, in drilling low and high pressure sands, and highly permeable lime formations, to employ as circulating column, oil, a mixture of oil and gas, or gas alone. Drilling in under pressure with oil offers several important advantages: (1) The well starts producing the moment the bit reaches the oil sand; (2) Washing, swabbing and bailing expense are avoided; (3) Oil sands are not penetrated by water and mud; (4) More hole per bit is made due to jetting action of oil and gas through the bit and more rapid removal of cuttings; (5) Immediate location of formations is obtained, because cuttings are carried to the surface more quickly.

For further details on the GUIBERSON Type E Drilling Head refer to Guiberson Section, 1939 Composite Catalog.

*In the patent infringement suit by Otis Pressure Control, Inc. and others, against The Guiberson Corporation, tried March 13th, 1939, the U. S. District Court decreed: "That patents to Collins 1560763, MacClatchie 1708316, and Otis 2052939, are NOT infringed by respondent" (The Guiberson Corporation).

Guiberson Will Introduce Larger-Size Drilling Head

The Guiberson Corporation will shortly place on the market a larger size Drilling Head, suitable for use with square kelly up to 6" and drill pipe up to 6⅝", for working pressures up to 3,000 lbs. (6,000 lbs. test). The new head will also be suitable for running up to 7" O.D. casing, under pressure.

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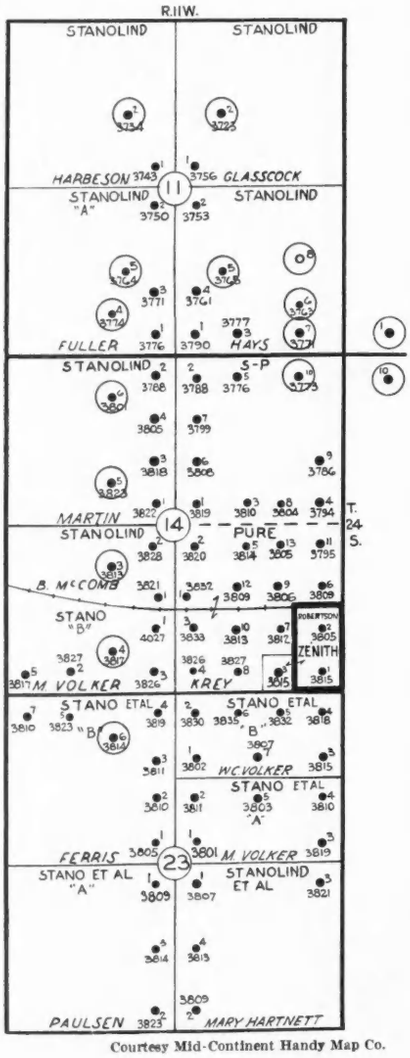
BETTER BE SAFE THAN SORRY

GUIBERSON

Well Spacing Practice Shifts to 20-Acre Plan In Western Kansas

By JOSEPH A. KORNFELD, Geologist and Petroleum Engineer

Twenty-acre spacing, now gaining popularity in western Kansas, was first adopted in the development of the Zenith pool of Stafford County, after a burdensome drilling program occasioned by 10-acre uneconomic spacing forced a shift to a wider spacing pattern. The 15 encircled wells shown on the map below in Sections 11, 12, 13, 14 and 23 in Township 24 south, Range 11 west, were drilled since November 16, 1938, the date when the plan was first put into effect by Stanolind Oil & Gas Co.



Courtesy Mid-Continent Handy Map Co.

FORCED development of oil reserves in western Kansas in the face of a continued low per-well allowable situation has resulted in application of a new 20-acre plan of drilling pattern, both in semi-wildcat exploration and in extensions of known pools previously developed on a 10-acre plan.

Western Kansas operators first turned to the 13.3-acre plan during 1937 at South Silica pool in Barton County on recognizing the uneconomic results of 10-acre spacing patterns in Arbuckle dolomite development. In the following 20 months, it was calculated that 439 unnecessary wells that would have been drilled under the old program were eliminated in development of 42 pools situated in 16 counties.

First Used at Zenith

Twenty-acre spacing was first applied in the fall of 1938 in the development of the Zenith pool in Stafford County. By November 1, the field gained a total of 69 wells rated at a combined daily potential of 169,053 barrels; these were completed from an average depth of 3800 feet in the Misener sand and dolomite. Of this total, Stanolind Oil & Gas Company had 40 wells on production in 17 leases, drilled on 10-acre spacing. Stanolind then tried 13.3-acre spacing on two wells in the northeast quarter of Section 23-24-11w, southwest of Zenith townsite. (Previously, the 10-acre spacing order for development of the field had been established during May, 1938, by the Kansas Corporation Commission, resulting in creation of 10-acre spacing units on the townsite.)

Yet considerable acreage remained undeveloped on nine Stanolind leases in the field, and the rate of development forced Stanolind to drill inside locations. Rather than drill 16 wells to a 160-acre section, Stanolind adopted the 20-acre well location pattern. U. G. Ferris 6 was staked on November 16, 1938, at CWL NE NW Section 23-24-11w. Other development by this firm followed this same pattern on the west side of the field and was continued northward into Sections 14, 11, 12 and 13; 15 such locations have been drilled and proven productive at this writing.

Initiated after 10-acre spacing had been utilized in a strongly-competitive drilling program, the net result amounted to a 13.3-acre development, but resulted in the saving of 18 unnecessary wells by not using the old 10-acre spacing pattern. Sinclair-Prairie Oil Company followed the plan during June with the staking of John Krey 10 at CNL NE NE Section 14-24-11w, in a new extension sector of the field. Moreover, the existence of a dolomite pay on the west side of

Superior METALS in Jarecki products

In the modern Jarecki plant at Erie, we maintain strict laboratory supervision of the Physical, Chemical and Metallurgical properties of all materials used in the manufacture of JARECKI Valves, Fittings and Specialties.

MALLEABLE IRON

has 20% to 25% Higher Tensile Strength

All malleable Iron used in Jarecki products is melted in perfectly controlled powdered coal air furnaces which produce iron with 20% to 25% higher tensile strength and elongation than cupola malleable. Average physical properties are: Tensile strength, 52,000 lbs. per sq. in.; Elastic limit, 36,000 lbs. per sq. in.; Elongation in 2", 12½%.

CAST IRON SEMI-STEEL

are Close-Grained — Uniform

Jarecki Cast Iron Valves and Fittings are made from close-grained, uniform gray iron of the highest grade. Test bars are run from every heat. Average tensile strength is 25,000 lbs. per sq. in.

Our Semi-Steel has a considerably higher tensile strength than Cast Iron, making it particularly suitable for valves and fittings in which extra strength is required. Jarecki Semi-Steel has an average tensile strength of 36,500 lbs. per sq. in.

BRASS, BRONZE HARD BRONZE

are of Highest Quality

JARECKI Brass Valves and Fittings are made of a good grade of Red Brass, with a tensile strength averaging 28,000 lbs. per sq. in., and elongation averaging 15% in 2". JARECKI Bronze is a high-grade alloy having a tensile strength averaging 30,500 lbs. per sq. in. and elongation of 16% in 2". JARECKI Hard Bronze has a high tin content which imparts great strength and hardness. Tensile strength averages 35,000 lbs. per sq. in. Elongation averages 18% in 2". A special Manganese Bronze used for valve stems has a tensile strength of 70,000 to 78,000 lbs. per sq. in., while a special Nickel Bronze used for discs has a tensile strength of 45,000 lbs. per sq. in. and a Brinell hardness of 172 to 187.

Our strict supervision of metals is an important factor in insuring that JARECKI products will meet your most exacting requirements.

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General Offices: St. Louis, Mo. Home Office and Factory: Erie, Pa., U. S. A.
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Branch Stores at All Important Places in the Oil Country.

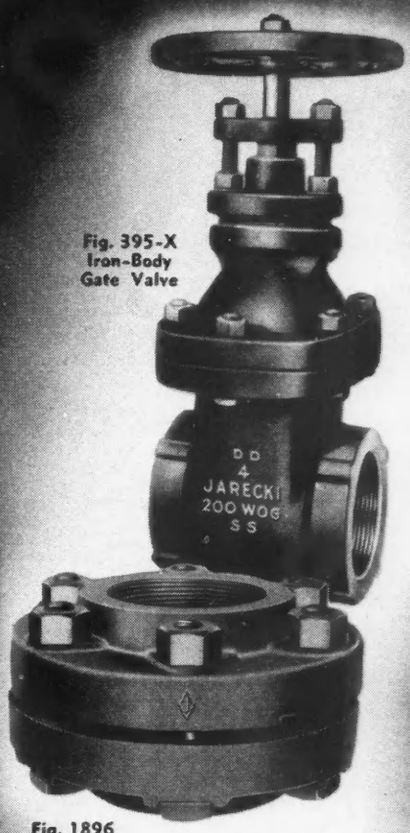


Fig. 395-X Iron-Body Gate Valve

Fig. 1896 Malleable Iron Ground-Joint Union

Fig. 57-H Heavy Oil Malleable Elbow

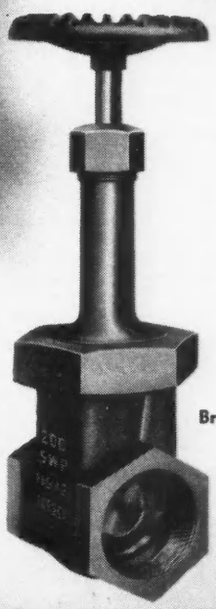
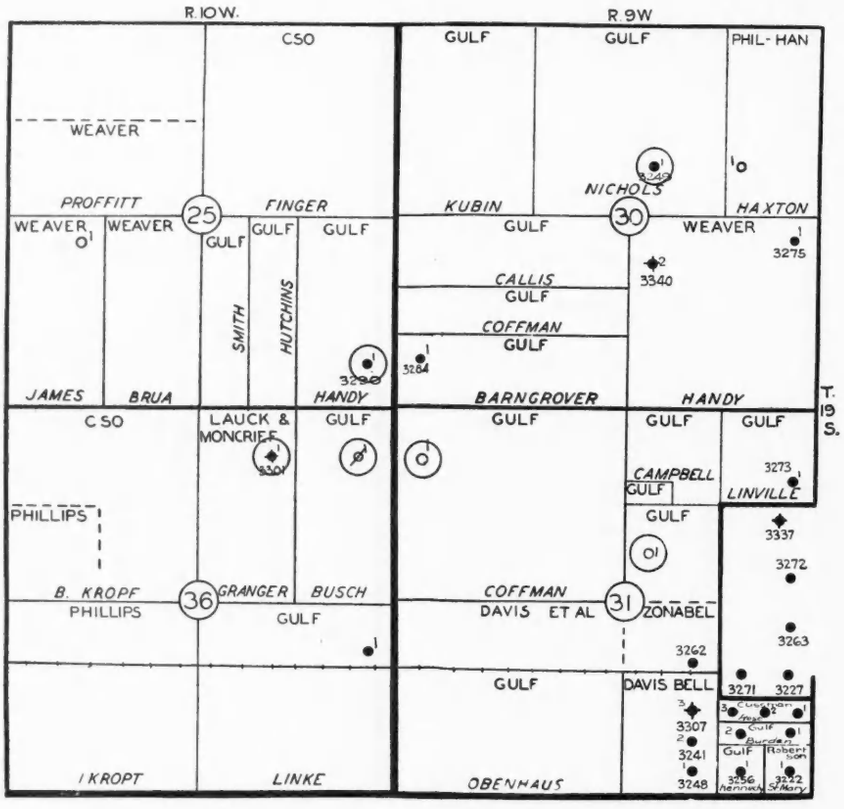


Fig. 481 Bronze Nickel Disc Gate Valve



Gulf Oil Corporation solved its own development program northwest of the Chase pool of Rice County when faced with a 640-acre block of lease expirations in the spring of 1939 by initiating a 20-acre spacing plan, illustrated here.

the field did not justify a 10-acre pattern from a recovery standpoint.

York State Follows Plan

The first independent oil-producing company to adopt the 20-acre development plan in western Kansas after its success at Zenith was York State Oil Company. Faced with the immediate expiration of a 160-acre lease in proximity to prolific Arbuckle dolomite production, Marchand 1 was staked on March 8, 1939, at CEL NE NE Section 24-20-12w, three miles south of Ellinwood. Gulf Oil Corporation, which held an offset lease suggested at the time the 20-acre plan, 330 feet and 660 feet from boundary lines. The discovery well was completed for an initial potential of 559 barrels of oil per day at 3320 feet in the Arbuckle dolomite the following month. Already two producing offsets have been completed and new development is scheduled to follow the same pattern.

Utilized in Chase Pool

Gulf Oil Corporation, faced with the problem of developing a block of 640 acres of short-term expirations northwest of the Chase pool of Rice County in the spring of 1939, successfully applied the 20-acre plan in the Barngrover extension to the area. Barngrover 1, which extended production 1 mile northwest, was staked at CWL SW SW Section 30-19-9w, on March 23, 1939, and was completed for an initial daily production of 1322 barrels of oil from 3284 feet in the Arbuckle dolomite. Already four producers have been drilled on this pattern, two dry holes drilled by Gulf and competitors on this spacing, and three additional locations staked matching the 330-foot, 660-foot method. Yet, it was not necessary to surrender a single lease in the area or was a burdensome drilling campaign initiated.

Successful at Midway

Midway (Arbuckle) pool of Rice County was discovered during May, 1939, east of the Chase pool by Phillips Petroleum Company when R. P. Proffitt 1, located at CEL NE NE Section 8-20-9w, on a 20-acre spacing pattern, was completed at 3263 feet in the Arbuckle formation. Gulf staked the north offset on the same plan, while Herndon and associates matched the Gulf-Kirkendall location. A half mile north on a Gulf farmout, George W. Hinkle and Phil-Han Oil Company of Wichita staked their Peterson 1 on 20-acre spacing; it was completed during July from the Arbuckle dolomite and was placed in the Chase pool.

To date, 33 wells have been drilled on 20-acre spacing in four pools in Rice, Barton and Stafford counties, Kansas; areas where this pattern is applied are productive from the Arbuckle formation with the exception of the Zenith pool, Misener sand and dolomite proposition.

Through use of foresight, Gulf Oil Corporation has insisted on 20-acre spacing in all projects to which it is a party, asking that the exploratory test be drilled on that plan at the outset, thereby establishing a wide spacing before the first well is brought onto production. Its application not only enables offset operators to meet required wells economically, but averts a serious drilling campaign not justified by low per-well allowables, a comparatively-restricted market, and a producing formation varying considerably in porosity and saturation characteristics.

With more than 600,000,000 barrels of proven reserves, western Kansas will continue to remain the proving ground for wider well spacing; the scene, complicated by unfavorable economic conditions, shows wasteful methods fast passing out of the picture.

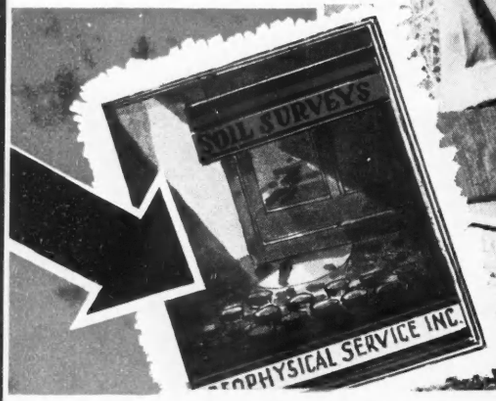
EEP DRILLING PROGRESS NUMBER

The OIL WEEKLY, July 31, 1939

"BACK TO THE SOIL"

PICTURED HERE ARE **G. S. I.** MEN TAKING SAMPLES FOR A SOIL SURVEY

A COPY OF THE BOOKLET **"SOIL SURVEYS"** WILL BE SENT ON REQUEST



GEOPHYSICAL SERVICE INC

EUGENE McDERMOTT
PRESIDENT

DALLAS, TEXAS

World Indebted to Deep Drilling and Prospecting Arts

Eighty years of petroleum history have witnessed remarkable advancements in the arts of drilling and prospecting. Few other major industries have experienced such extensive improvements in methods and equipment as have taken place in these two sciences, which are responsible for the discovery of such huge volumes of crude oil that a substantial future reserve supply has been built up while meeting the most rapid consumption expansion yet known by any of the other necessary commodities. Without the remarkable achievements attained in these arts, oil could not have prospered and expanded into the third largest industry of the United States, and many another business would have suffered also.

Ever since Colonel Edwin Drake completed the world's first producing oil well at Titusville, Pennsylvania, in August, 1859, there has been a steady trend toward greater drilling depths and expansion in the territory yielding crude oil, as better methods and machinery permitted man to search for it in new regions and at deeper levels.

However, the most amazing achievements have been in quite recent years, both in locating deep-seated structures and in drilling to deep levels.

The past 12 years have nearly doubled the drilling depth record. While 68 years of oil well drilling took place before the 8000-foot horizon was reached, an additional 7000 feet has been attained in the 12 years since that time. The past 1½ years have been outstanding, adding nearly 3000 feet to the deep drilling record, as penetrations were made to 13,000, 14,000 and 15,000 feet for the first time. Furthermore, of the 312 tests that have drilled below 10,000 feet since that level was first attained 8 years ago, 246 or 80 percent have been in the last 18 months.

The art of prospecting likewise has advanced more rapidly in recent years. Whereas 9000 feet was the approximate limit for mapping beds 12 years ago, today structures are being delineated with regularity at 13,000 to 15,000 feet, and the past 18 months have seen depths up to 25,000 feet reached in some of the deep sedimentary areas. The correctness of some of these surveys is attested by the discovery of 25 fields in the United States that are producing from between 10,000 and 13,275 feet, and every one of these has been proven productive by the drill in only the last 2½ years.

The industry and the world at large are greatly indebted to the numerous firms and individuals that have contributed to the advancements of these two arts. They are saluted in this issue of The OIL WEEKLY, devoted especially to Deep Drilling Progress.

An exceedingly large number of companies and men have asssisted in the preparation of the data presented on the following pages, and to them we acknowledge our sincere gratitude—and to the industry we express the hope that the compilation of the facts and opinions into concise symposiums may contribute something to future advancements in the arts of drilling and prospecting, which we so confidently anticipate.

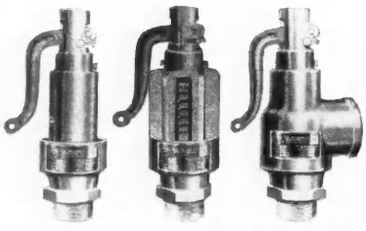
On Wells of Any Depth

INFERNO Steam Equipment

Saves You Money!

Deep drilling requires good steam equipment. Good steam equipment to many experienced, careful buyers in this and foreign countries, means INFERNO Steam Equipment.

And properly so. Wells are never too deep or too shallow for INFERNO Steam Equipment to pay handsome dividends in safety, economy and efficiency.

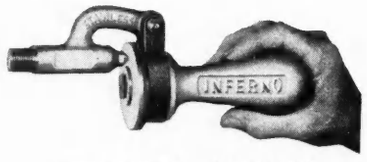


INFERNO
2" POP SAFETY VALVES

Meet all A.S.M.E., A.P.I. and state requirements. Now stamped with A.S.M.E. symbol. Five types, including new High Capacity Top Outlet Exposed Spring Type. Made to last 3 or 4 times as long as conventional safety valves. Ask for Bulletin No. 11-A.

INFERNO
"CLAMP TYPE"
REFLEX GAUGES

Built in Navy Bronze or Stainless Steel to exceed all A.S.M.E. and government requirements. New clamp action and heavy glass gives long life. Glass can be changed with great speed. Ask for Bulletin No. 19-A.



INFERNO GAUGE COCKS

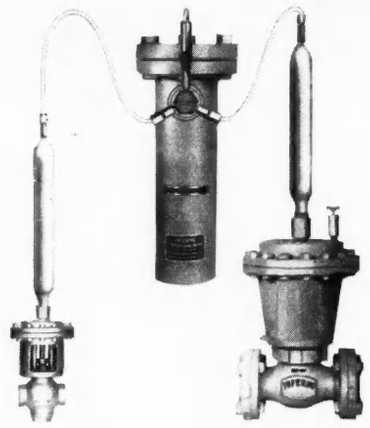
. . . are made of Navy Bronze or Stainless Steel. Both have renewable stainless steel nozzle tip. Reversible seat turns with handle. A TWIST OF THE WRIST and A NEW SEAT without the use of any tool. Available with pull-chain attachment. Ask for Bulletin No. 18-A.

INFERNO FIRING CONTROL

. . . regulates fire and draft automatically, using either gas or oil. Eliminates human element. Blowers can be operated automatically. Saves fuel, labor, boiler repairs. Ask for Bulletin No. 8.

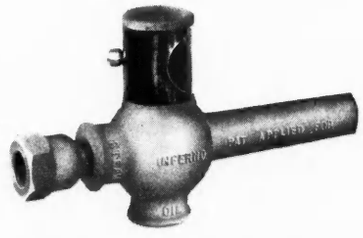
REPAIR DEPARTMENT

Inferno operates a precision repair department for all kinds and makes of precision instruments, including pressure gauges, recording gauges, safety valves, thermometers and regulators. Have your supply store ship your equipment to us COLLECT for FREE ESTIMATE. All work guaranteed.



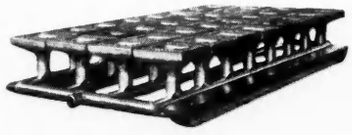
INFERNO FEED WATER SAFETY UNIT

Entirely automatic. Holds water at any desired level. If water supply fails, shrill whistle blows. If whistle is ignored, fire is automatically cut off. Ask for Bulletin No. 15.



INFERNO OIL BURNER

. . . uses any gravity fuel oil at any pressure. Clear, intense heat without smoke. Fires any size boiler. Ask for Bulletin No. 12.



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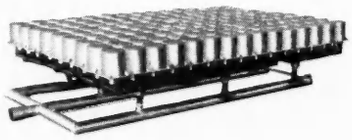

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SOLD THROUGH LEADING SUPPLY STORES

Number of 10,000-Foot Tests Increasing Rapidly

By WARREN L. BAKER, Editor

ALTHOUGH 72 years of oil industry history had passed before a single test achieved a penetration of 10,000 feet below the surface of the earth, in the scant 8 years since that occasion (May, 1931), 312 tests have drilled below that level. Furthermore, of these 312 deep tests drilled to date throughout the world, 246, or 80 percent, have been during the past 18 months. These statistics accurately picture the present trend toward the drilling of a larger number of operations to great depths, showing an exceedingly rapid expansion in 10,000-foot and deeper drilling.

There were 145 tests completed below 10,000 feet during 1938, and the first 6 months of 1939 have seen 77 such completions. In addition there were 24 tests drilling at some level below 10,000 feet on July 1 of this year.

Moreover, for years there has been a steady trend toward greater depths, and the past 1½ years has been outstanding in this respect. The past 18 months have seen the addition of nearly 3000 feet to the deep-drilling record, as the first penetrations were made to 13,000, 14,000 and 15,000 feet. The past 12 years have nearly doubled the deep drilling record. While 68 years of oil-well drilling was required before the first 8000-foot test was drilled, in the 12 years since that time an additional 7000 feet has been added. This rapid growth in penetration depths is of significance, for it means that it is possible to test 7000 more feet of formation today than in 1927. Whereas the first test drilled for oil (in August, 1859) was but 69½ feet, the present world's depth record was established slightly over a year ago at 15,004 feet, or 215 times as great as the original well.

The ability to drill to these great depths is an indication of improved practices and equipment. The remarkable regularity with which deep holes are being drilled is indicative that recent years have witnessed important improvements in both equipment and methods. Deeper drilling is the result of engineering, which has developed improved metals, heavier and sturdier equipment, advanced methods and practices. At the same time experience and greater confidence also have been factors in making such accomplishments possible.

The actual scientific value of drilling to 10,000 and 15,000 feet is of considerable importance. Each deep test contributes to the advancement of drilling technique to a higher plane. They are to drilling men what the Indianapolis speedway contest claims to be to the automobile manufacturers and

Record-Breaking Depth Tests Since 1927

Year		Feet
1927	Chansler-Canfield-Midway Oil Company's Olinda 96, Olinda, California	8,046
1928	Texon Oil & Land Company's University 1-B, Big Lake, West Texas	8,523
1929	Shell Oil Company's Nesa 1, Long Beach, California	9,280
1930	Standard Oil Company of California's Mascot 1, Midway, California	9,753
1931	Chansler-Canfield-Midway Oil Company's Hobson A-2, Rincon field, Ventura County, California	10,030
1931	Penn-Mex Fuel Company's Jardin 35, State of Vera Cruz, Mexico	10,585
1933	North Kettleman Oil & Gas Company's (later taken over by Union Oil Company) Lillis-Welch 1, Kettleman Hills, Kern County, California	10,944
1934	General Petroleum Corporation's Berry 1, Belridge, Kern County, California	11,377
1935	Gulf Oil Corporation's McElroy 103, Gulf-McElroy, Upton County, West Texas	12,786
1938	Continental Oil Company's KCL A-2, Wasco, Kern County, California	15,004

Number of Tests Drilled Below 10,000 Feet Has Increased Rapidly in Past 18 Months

DEPTH ZONES	1931	1932	1934	1935	1936	1937	1938	1939*	Total
Number 15,000-foot Tests	..	..	..	..	..	..	1	..	1
Number 14,000-foot Tests	..	..	..	..	..	..	1	..	1
Number 13,000-foot Tests	..	..	..	..	..	..	8	6	14
Number 12,000-foot Tests	..	..	..	1	1	5	4	9	20
Number 11,000-foot Tests	..	..	3	1	1	5	52	28	90
Number 10,000-foot Tests	3	1	1	5	8	31	79	58	186
Total for All Depths	3	1	4	7	10	41	145	101	312

* Includes both actually completed tests and those still drilling at end of first six months, of which 77 were completed and 24 drilling.

Eight Deepest Drilled Tests in World
(To July 1, 1939)

Year		Feet
1938	Continental Oil Company's KCL A-2, Wasco Field, Kern County, California	15,004
1938	Superior Oil Corporation's Helbling 1, Rio Bravo Field, Kern County, California	14,018
1939	Shell Oil Company, Inc.'s KCL B-87-4, Canal Field, Kern County, California	13,957
1938	Union Producing Company's Brown 1, Agua Dulce Field, Nueces County, South Texas	13,728
1938	Standard Oil Company's KCL 8-B-1, Wasco Field, Kern County, California	13,716
1938	Continental Oil Company's KCL A-c, Wasco Field, Kern County, California	13,644
1939	Standard Oil Company of California's Elrich Community 1, Greeley Field, Kern County, California	13,538
1938	Fohs Oil Company's Buckley Bourg 1, West Dulca Field, Terrebonne Parish, Louisiana Coast	13,409

owners. The earlier 10,000-foot tests showed petroleum and mechanical engineers the problems encountered at such depths, and resulting improvements in drilling practices and machinery have made it easier and safer for others to reach these levels.

There have been 186 tests that have attained depths between 10,000 and 11,000 feet, of which 137 have been during the past 18 months.

It was not until 1934 that the first test was carried to 11,000 feet, but penetration to this level became common during the past 1½ years when 80 holes were drilled to between 11,000 and 12,000 feet.

The first 12,000-foot test was 4 years ago. Today, 20 of these tests have been drilled, of which 13 have been in the last 18 months.

Although the first test to reach 13,000 feet was only during 1938, 14 have achieved this level today.

Only one 14,000-foot and one 15,000-foot test has been drilled.

In view of the trend toward ever increasing depths, it is to be expected that deeper holes are to come. In fact, oil men are discussing 18,000 feet at present, and this level does not appear an impossibility with equipment already on the market.

Drilling Depth Records for Various Countries and States
(As of July 1, 1939)

STATE	Depth	Year Made
United States:		
California	15,004	1938
Texas	13,728	1938
South Texas	13,728	1938
East Texas	11,303	1938
Gulf Coast	11,612	1937
West Texas	12,786	1935
Louisiana	13,409	1938
North Louisiana	11,486	1938
Gulf Coast	13,409	1938
Oklahoma	12,925	1939
North Dakota	10,281	1938
Colorado	10,500	1939
Outside United States:		
Germany	12,726	1938
Japan	11,550	1938
Roumania	11,092	1934
Mexico	10,585	1931
Canada	10,209	1938
Iran	10,026	1936
Trinidad	10,015	1939

United States Leads

Most of the 10,000-foot or deeper holes have been drilled in the United States, where 303 of the 312 deep tests are located. Mexico and Germany have furnished 2 of the deep tests each, while Roumania, Iran, Canada, Trinidad and Japan have completed 1 apiece.

Whereas the deepest depth drilled in the United States is 15,004 feet, the greatest penetration in other countries is 12,726 feet reached by a German test during 1938.

Louisiana Coast Leading Sector

Within the United States, the Gulf Coast section is the leading center of deep drilling by a wide margin. The entire State of Louisiana has had 145 tests carried between 10,000 and 13,409 feet, of which all but 7 have been in the Coastal district. An even 100 deep tests have been completed in Louisiana during the past 18 months, and 15 are drilling at present.

California is the second ranking state, having 88 to its credit. There have been 72 tests completed below 10,000 feet in the past 18 months on the Pacific Coast, and five are drilling at this time.

In third place is Texas with 62. Oklahoma follows with 6, one of which is drilling at this time at the greatest depth in the history of the state. The well had reached 12,925 feet on July 1.

North Dakota has had one 10,000-foot completion, while Colorado entered the list of states with such deep tests this year. Colorado's test is still drilling below 10,500 feet.

The present ability to drill to 10,000, 11,000, 12,000 and 13,000 feet with such regularity, as has been demonstrated, has been gained only through years of experience, study and determination on the part of oil company men and equipment men. So successful have they been that the drilling of 13,000-foot holes attracts no more attention now than did 7000 and 8000 feet a very few years ago.

Literally, today's deepest tests are likely to be just "also rans" tomorrow, for the practicability of such operations has been proven by past performances.

Louisiana Is Site of Nearly Half of 10,000-Foot Tests That Have Been Drilled in United States

STATE	Depth	1931	1932	1934	1935	1936	1937	1938	1st Half 1939 Comp.	1st Half 1939 Drlg.*	Total All Yrs.
California	10,000	1	1	0	1	1	3	12	4	3	26
	11,000	..	..	1	0	1	1	30	11	2	46
	12,000	..	..	..	..	..	1	1	2	0	4
	13,000	..	..	..	..	..	..	4	6	0	10
	14,000	..	..	..	..	..	..	1	0	0	1
	15,000	..	..	..	..	..	..	1	0	0	1
Total by Years	.....	**1**	**1**	**1**	**1**	**2**	**5**	**49**	**23**	**5**	**88**
Louisiana	10,000	..	..	..	4	2	17	45	18	11	97
	11,000	..	..	..	..	..	2	15	13	2	32
	12,000	..	..	..	..	1	4	2	4	2	13
	13,000	..	..	..	..	..	..	3	0	0	3
Total by Years	.....	..	..	..	**4**	**3**	**23**	**65**	**35**	**15**	**145**
Texas	10,000	..	..	1	0	2	10	20	18	1	52
	11,000	..	..	..	1	0	1	5	0	1	8
	12,000	..	..	..	1	0	0	0	0	0	1
	13,000	..	..	..	..	..	..	1	0	0	1
Total by Years	.....	..	..	**1**	**2**	**2**	**11**	**26**	**18**	**2**	**62**
Oklahoma	10,000	1	0	0	0	1	1	0	0	0	3
	11,000	..	..	1	..	..	..	1	0	0	2
	12,000	..	..	..	..	..	..	..	0	1	1
Total by Years	.....	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**6**
North Dakota	10,000	..	..	..	..	..	..	1	0	0	1
Colorado	10,000	..	..	..	..	..	..	..	0	1	1
TOTAL UNITED STATES	.....	**2**	**1**	**3**	**7**	**8**	**40**	**142**	**76**	**24**	**303**

* Drilling tests are as of July 1, 1939.

Nine 10,000-Foot Tests Have Been rilled Outside of U. S.

COUNTRY	1931	1932	1934	1935	1936	1937	1938	1939	Total
Mexico	1	0	0	0	1	0	0	..	2
Roumania	..	..	1	..	..	..	..	..	1
Iran	..	..	..	..	1	..	..	..	1
Canada	..	..	..	..	..	..	1	..	1
Japan	..	..	..	..	..	0	1	..	1
Germany	..	..	..	..	..	1	1	..	2
Trinidad	..	..	..	..	..	..	..	1	1
TOTAL OUTSIDE OF UNITED STATES	**1**	**0**	**1**	**0**	**2**	**1**	**3**	**1**	**9**

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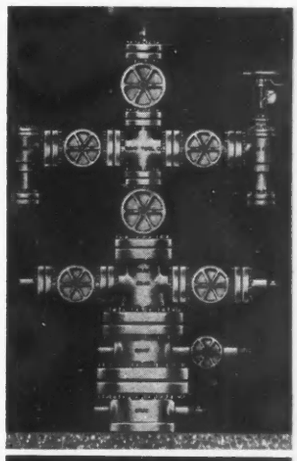

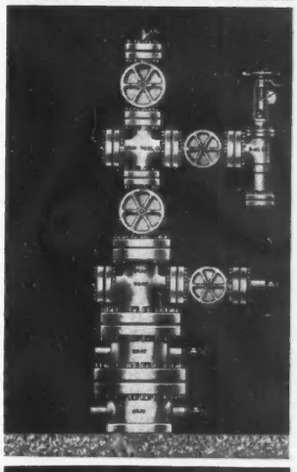

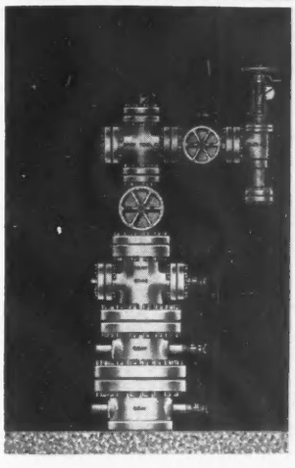

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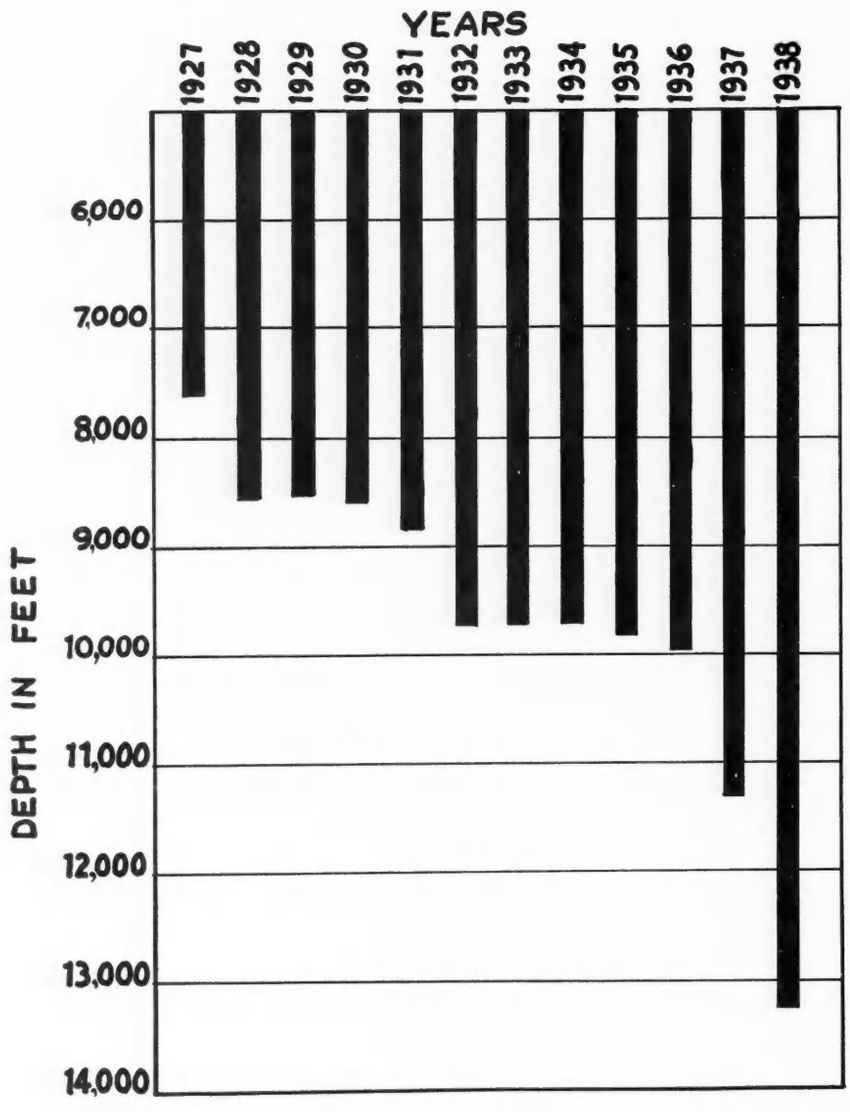
GRAY
TOOL COMPANY
HOUSTON – TEXAS

Producing Depth Record Has Increased Steadily

THE drilling of 10,000-foot and deeper holes, a rapidly growing trend during the last five years, has been proven worthwhile by the discovery of nearly half a billion barrels of oil below this depth in the 2½ years since the first such completion. While the world's first producing oil well was completed with difficulty at a depth of only 69½ feet 80 years ago, this valuable mineral is being recovered from depths up to 13,266 feet today, nearly 200 times deeper than the original well.

Ever since Colonel Edwin Drake achieved fame with his discovery oil well at Titusville, Pennsylvania, on August 27, 1859, there has been a steady trend toward greater drilling depths, and as the bit went deeper into the earth oil also has been found at lower levels. During the interim between 1931, when the first test in history reached the 10,000-foot level, and January, 1937, when the first commercial yield from this depth was attained, it appeared this might not be true at such greater footage. But since that time the ratio of discoveries to deep wildcats drilled has been quite high, 27 fields having been opened.

While the industry's trend from the time of its birth has been toward deeper drilling, the most outstanding achievements in the finding of deep production have been in very recent years. Although it was 77½ years after Drake's well that the first 10,000-foot production was procured, the scant 2½ years since that time has seen the addition of 3000 feet to the deep production record. The past 12 years have witnessed an advancement of 5650 feet in the record for deep production; from 7591 feet in 1927 to 13,266 feet at present.



The maximum producing depth has increased from 7591 feet in 1927 to 13,266 feet today. The rate of increase, as shown on the accompanying graph, has been accelerated in recent years.

An Economic Problem

Now that the possibility of obtaining production from below

YOU CAN REDUCE ROPE EXPENSE

with PRE-FORMED Rotary Drilling Lines

We Recommend—

❶ **"UNION-formed" 6x19 Flexible Seale with Wire Rope Center,** for deep drilling. "UNION-formed" (our superior pre-formed) lines of this type drilled 25% of the wells in the Oklahoma City Field.

❷ **"UNION-formed" 6x19 Filler Wire with Hemp Center,** for shallow rotary territory. This type of line has proved ideal for such shallow areas as East Texas.

❸ **"UNION-formed" 6x16 Filler Wire with Hemp Center,** for Kansas fields. This line was designed by Union engineers especially for use in Kansas, and it definitely overcomes difficulties experienced by Kansas operators with other constructions.

Recent experience has proved that pre-formed rope, though slightly higher-priced, makes the most economical Rotary Drilling Line. This is because Rotary lines must withstand severe bending, drum-grinding and crushing. "UNION-formed" lines are slower to fatigue under repeated bending because the individual wires and strands are stress-free as laid into the rope. It also wears longer under drum grinding and crushing because the exactly formed wires unite their strength to give the rope a firm body—and because when outside wires become worn they do not arch in the strand but lie flat.

The photograph was taken at a Superior Oil Company well just outside of Shreveport, drilled by F. W. Martin & Company. The men, left to right, are: R. N. McDowell, derrick man; J. A. French, helper; W. J. Craig, foreman; J. C. Sartor, derrick man; J. E. Womack, driller; C. C. Gilger, drilling supt.; C. M. Womble, driller; W. J. Morris, fireman; Paul Cooper, H. M. Markham, and J. C. Carroll, helpers; C. C. Robinson, Union Wire Rope Corp.

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Don't neglect lubrication of wire rope, for best results. Rusty ropes become stiff and unbalanced, causing one-strand breaks, as above shown. Rusty wires lose fatigue properties and chafe each other and the core. A thin, heated oil that penetrates to the core is the best rope lubricant.

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UNION WIRE LINES

The "ULTIMATE LOW COST WIRE ROPE"

Number of U. S. 10,000-Foot Producing Fields Are Increasing Steadily

	1937	1938	1939*	Total
Fields Found 10,000-11,000 Feet	7	7	6	20
Fields Found 11,000-12,000 Feet	1	1	1	3
Fields Found 12,000-13,000 Feet	..	..	..	..
Fields Found Below 13,000 Feet	..	2	..	2
Total Fields Found	8	10	7	25
Average Depth of Fields (Feet)	10,705	11,019	10,582	10,769
Estimated Ultimate Recovery (Bbls.)†	380,500,000	78,750,000	21,500,000	480,750,000
Average Ultimate Recovery (Bbls.)	47,562,500	7,875,000	3,071,428	19,230,000

* First six months of year only.
† Fields found in 1938 and 1939 are too inadequately developed to permit any kind of proper estimates, and figures shown here probably will be increased several fold by later developments.

10,000 feet has been proven, the most important problem in this connection appears to be an economic one. With conditions as they are today in the United States, when production is curtailed drastically and a fairly low price exists for crude, the payout on such investments as required for a 10,000-foot test is extremely lengthy. For this reason it is natural that such operations would be shunned in many instances. But regardless whether the immediate trend is toward additional 10,000-foot drilling or not, it has been proven that wells can be completed at such depths. Therefore, it is to be expected that when the economic situation is more favorable to such expenditures that a great many tests will be carried to these horizons in areas where sedimentary conditions are promising.

To a considerable extent, the industry since its earliest days has depended upon deeper prospecting for the discovery of sufficient volumes of supplies to meet the most rapid expansion in consumption yet experienced by any commodity. What exceptionally deep drilling has meant to the industry from this standpoint is attested by the discovery of 27 fields since mid-January, 1937, that are yielding production from between 10,000 and 13,266 feet.

Twenty-five of the 27 fields now producing from below 10,000 feet are in the United States, another is located just north of the line at Turner Valley, Canada, and the other is in the Kinsui field of Formosa, Japan.

The twenty-five 10,000-foot producing fields in the United States are estimated to have an ultimate recovery of 480,750,000 barrels at this time. However, it is more than likely that these estimates will be revised upwards considerably in the future, when additional exploitation has taken place. The majority of the pools have not experienced sufficient development in the deeper horizons, many having but one well, to obtain much of an idea of their size and probable recoveries. Therefore, a goodly number of the fields are credited at this time with comparatively small yields, particularly those fields found in 1938 and 1939.

Still, even the present estimates of ultimate yields in these fields is as much as has been found in the current Illinois campaign with the drilling of 4149 tests and 5,343,150 feet of hole. In contrast, the 262 tests carried to 10,000 feet or more since January 1, 1937, including all dry holes, have represented less than 3,000,000 feet of hole. The smaller amount of footage drilled in the deeper holes should largely offset the higher cost per foot that exists from such operations.

Of the 25 fields in the United States producing from 10,000 feet, 20 are in the depth range from 10,000 to 11,000 feet; 3 are producing from between 11,000 and 12,000 feet; and 2 have productive horizons below 13,000 feet. Eight of these 25 fields were found in 1937, 10 in 1938, and so far 7 have been discovered in 1939.

Three sectors of the United States are the locale for these deep fields. The Louisiana Gulf Coast leads with 16 of the fields, California has 7 and the Texas Gulf Coast is the home of the two remaining ones.

10,000-Foot Producing Fields in United States

FIELD AND COUNTY	Year Found*	Average Depth	Ultimate† Recovery
California:			
Coles Levee, Kern County	1939	10,010	17,500,000
Greeley, Kern County	1938	11,500	20,000,000
Kettleman North Dome, Kings and Fresno Counties	1938	10,810	40,000,000
Rio Bravo, Kern County	1937	11,500	75,000,000
Ventura Avenue, Ventura County	1937	10,500	87,500,000
Long Beach, Los Angeles County	1938	10,150	1,000,000
Wasco, Kern County	1938	13,175	5,000,000
Louisiana Gulf Coast:			
DeLarge (Dulac), Terrebonne Parish	1938	13,265	5,000,000
Horseshoe Bayou, St. Mary Parish	1939	11,847	Inc. below
Horseshoe Bayou, St. Mary Parish	1937	10,900	10,500,000
La Pice, St. James Parish	1939	10,915	500,000
Bateman Lake, St. Mary Parish	1937	10,905	2,000,000
Kennilworth, St. Bernard Parish	1939	10,610	1,000,000
Lake Barre, Terrebonne Parish	1938	10,520	500,000
Lirette, Terrebonne Parish	1937	10,500	1,500,000
Jeanerette, St. Mary Parish	1939	10,485	Inc. below
Jeanerette, St. Mary Parish	1938	10,200	500,000
Long Lake, Lafourche Parish	1937	10,400	4,000,000
South Houma, Terrebonne Parish	1938	10,310	2,000,000
Lafitte, Jefferson Parish	1937	10,265	100,000,000
Raceland, Lafourche Parish	1938	10,200	5,000,000
South Roanoke, Jeff Davis Parish	1939	10,120	1,000,000
Villa Platte, Evangeline Parish	1939	10,085	1,000,000
Texas Gulf Coast:			
Old Ocean, Brazoria County	1937	10,670	100,000,000
Wilson Creek, Matagorda County	1938	10,058	250,000

* Year sands below 10,000 feet proven productive.
† Many of the fields, particularly those found during 1939, have so few wells it is practically impossible to estimate ultimate recoveries. No doubt most of these fields will prove more prolific than figures here indicate.

Record-Holding Producing Wells at End of Each Year Since 1927

Year		Feet
1927	E. J. Miley's Athens 6, Rosecrans field, Calif.	7,591
1928	Texon Oil and Land Company's University 1-B, Big Lake field, West Texas	8,523
1930	Star Petroleum Company's Colby 2, Long Beach, Calif.	8,550
1931	Tide Water Associated Oil Company's Lloyd 57, Ventura Avenue, Calif.	8,823
1932	Tide Water Associated Oil Company's Lloyd 83, Ventura Avenue, Calif.	9,710
1935	Tide Water Associated Oil Company's Lloyd 131, Ventura Avenue, Calif.	9,836
1936	The Texas Company's Lafitte 5, Lafitte field, Southern Louisiana	9,950
1937	Union Oil Company's Kernco 1-34, Rio Bravo field, Kern County, Calif.	11,302
1938	Fohs Oil Company's Bourg 1, West Dulac field, Southern Louisiana	13,266

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So outstanding has been the success of "Securaloy" Drillable Pipe that it has been installed in over one thousand wells thus far ... and the number is pyramiding faster every day!

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In many of these wells the "Securaloy" equipment has already been drilled up—quickly, smoothly and economically—to make way for further development operations. In some installations the "Securaloy" was used to aid cementing operations and was drilled up almost as soon as it was installed. In others, the "Securaloy" was drilled up only after a long period of service (one of the very first "Securaloy" installations is still in use, giving perfect service) ... and then only to make way for further development operations. *But in all cases, the "Securaloy" equipment was removed from the well without the expense and risk of a fishing job—a point of vital importance!*

And what is even more interesting, many of these more-than-a-thousand wells were developed by revolutionary methods that were never before feasible until the drillable feature of "Securaloy" made them practical—methods that saved money and produced *better* wells at *less* cost.

When "Securaloy" was first placed on the market, it was one of the most thoroughly pre-tested products ever offered the oil industry. And since that time it has been even more thoroughly tested and proved in general use—by oil men all over the world and under almost every conceivable operating condition.

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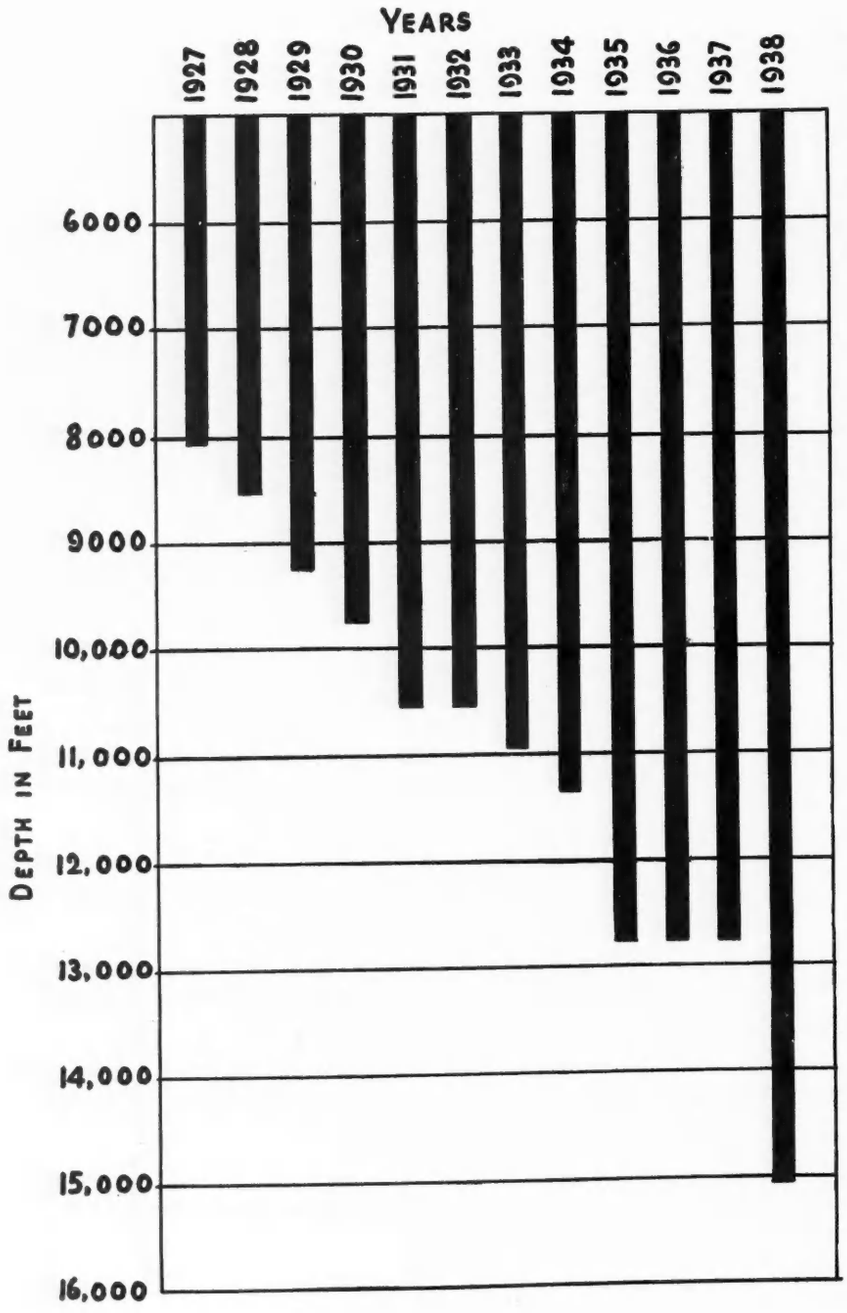
Improved Practices Permit High Speed Deep Drilling

By BRAD MILLS, Associate Editor



The record for deep drilling has been nearly doubled in the last 12 years. In 1927 the deepest penetration was 8046 feet, and today it is 15,004 feet. The ability to reach such depths is indicative of vast improvements in techniques and equipment.

DRILLING has become a highly scientific and efficient art. Today it is possible to penetrate approximately 3 miles below the earth's surface with such rapidity that little more time, if any, is required than was needed for the 5000-foot test of but a very short time ago. It is probable no other major industry has experienced such great strides in methods and equipment as have taken place in drilling.

Attainment of present drilling depths has been made possible by a combination of many improved operating practices and vastly superior equipment. The current speed and depth records largely reflect the correct application of improved technique and tools. However, this article is to deal with only some of the more important methods, leaving most of the discussion on equipment for another article in this issue.

There have been many revolutionary and interesting changes in drilling practices, particularly in very recent years. Speed of rotation, weight on bit, and controlled straight holes are only a few of the numerous important drilling practices that have figured prominently

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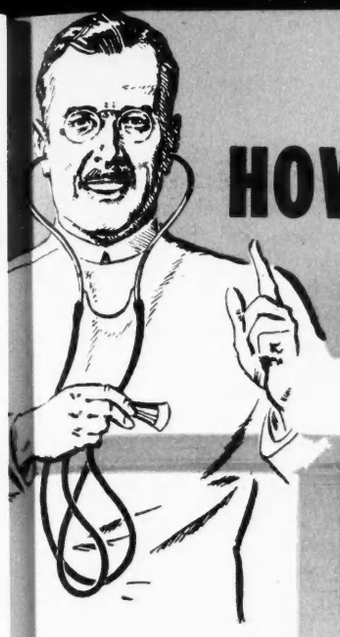

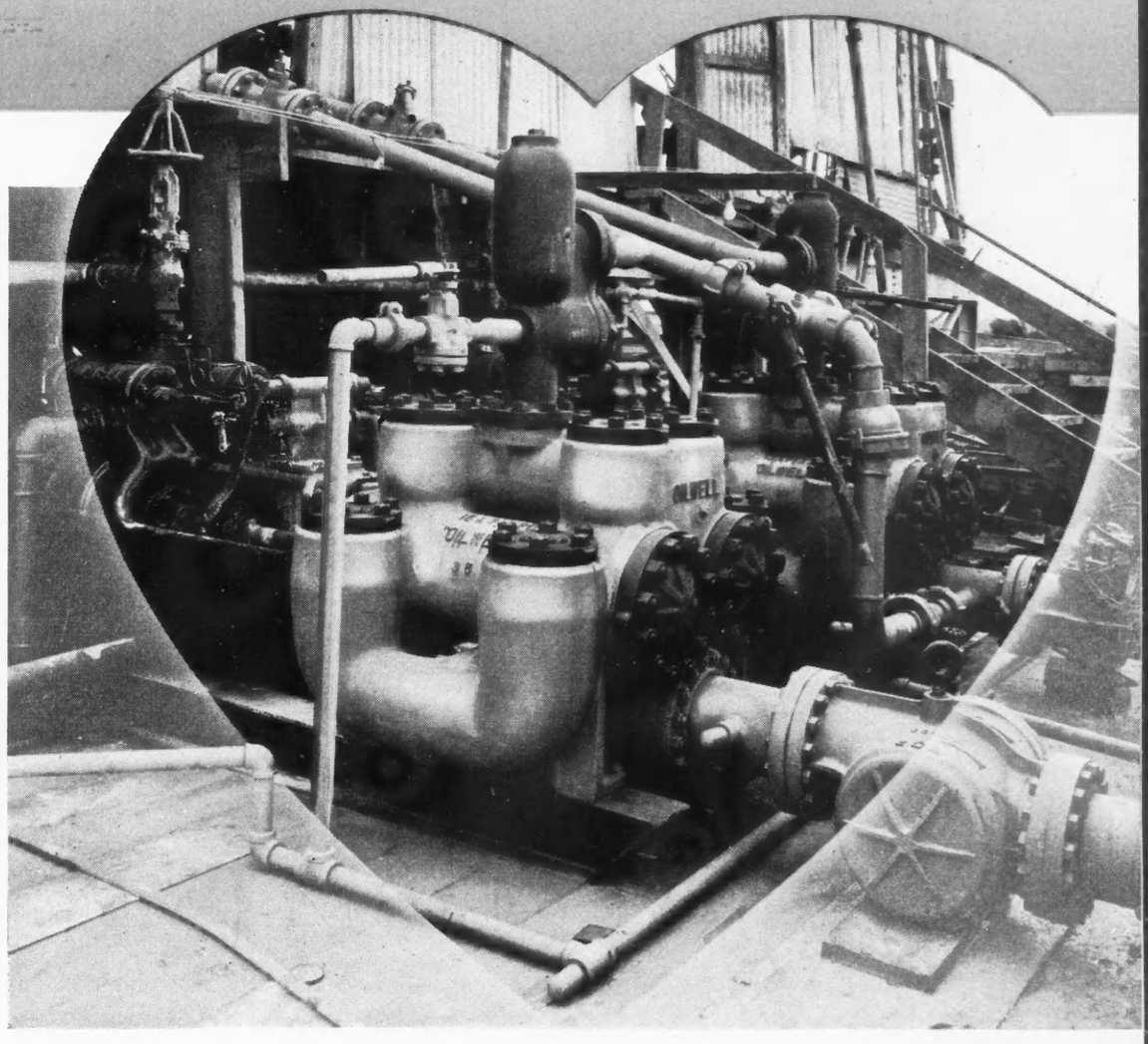

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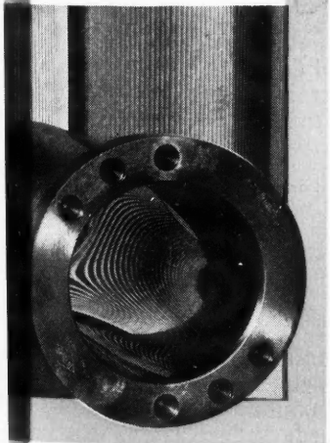

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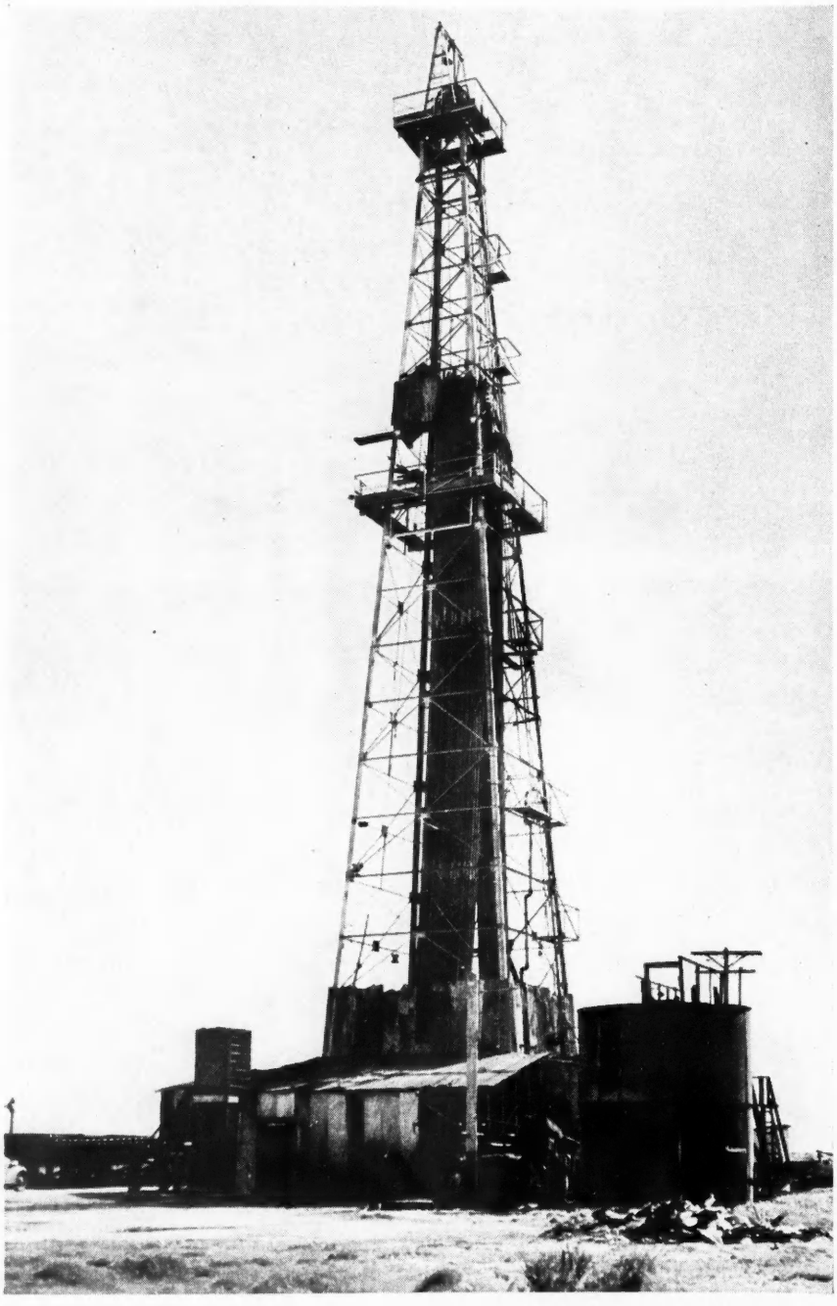
Deep Drilling Speeded Up

Improved practices have resulted in sharply reduced drilling time in all deep areas. Union Oil Company is believed to have established a new wildcat speed record recently, when it drilled KCL 1-36, located between Shafter and Wasco, California, to 10,000 feet in an elapsed time of 19 days, including the running of a string of casing to 1500 feet. The well subsequently was abandoned at 12,985 feet, and the 11,485 feet of open hole is believed to be a record, although there is a tendency to carry a greater amount of open hole in most of the deep operations.

The two major deep drilling areas, California and the Gulf Coast region of Texas and Louisiana, at present differ considerably in several deep drilling practices. Such major operating phases as rotating speeds, weight on bit and deviation from vertical do not find full agreement in the two territories. Differences in formations and economic demands have been conspicuous factors in changed operating practices in these deep producing districts.

Wherever there is an extreme operating practice, either the other drilling districts are attempting to follow or there is a tendency to tone down the radical departure where it originated. A gradual flattening out of practices has come about in the various deep major drilling areas, and in the future the best procedures will be borrowed and combined to develop methods superior to those of today.

During the depression period, 1930 to 1934, the Gulf Coast probably forged ahead of California in research and actual deep drilling developments. During the past two years California has regained its position, and because of deep oil discoveries is gradually developing new and important practices. The reduction in average drilling time to 10,000 feet has been conspicuous in both California and South Louisiana, each with its own operating ideas.



Drilling history was made by this test, Continental Oil Company's KCL A-2, at Wasco, California. It is the deepest test ever drilled, having reached 15,004 feet during the spring of 1938. Later it was plugged back to 13,175 feet, and became the first well in history to produce from this great a depth.

High Rotating Speeds

High rotating speeds in California are a radical departure from the old 125 r.p.m. of a few years ago. Several operators have attained rotating speeds in excess of 500 r.p.m. and top speeds of 650 r.p.m. have been reported. Two operators, Superior Oil Company and Union Oil Company, commonly rotate at speeds between 400 and 500 r.p.m. in favorable formations. During a forced test to attain a maximum rotating speed, one operator actually "put" from 500 to 600 horsepower into the drill pipe. Subsequent tests at half the maximum rotating speed, or about 300 r.p.m., showed that 300 horsepower would do the work with 350 pounds of steam.

Most of the conservative California operators have not attempted such high rotating speeds at any depth. Continental Oil Company regards 250 r.p.m. a safe operating maximum for the favorable formations, and has established some good deep drilling records on this basis.

Drilling and Exploration Company has attempted to establish a basis for maximum and minimum rotating speeds under various conditions in deep California operations. This company has rotated from 500 to 550 r.p.m. in an experi-

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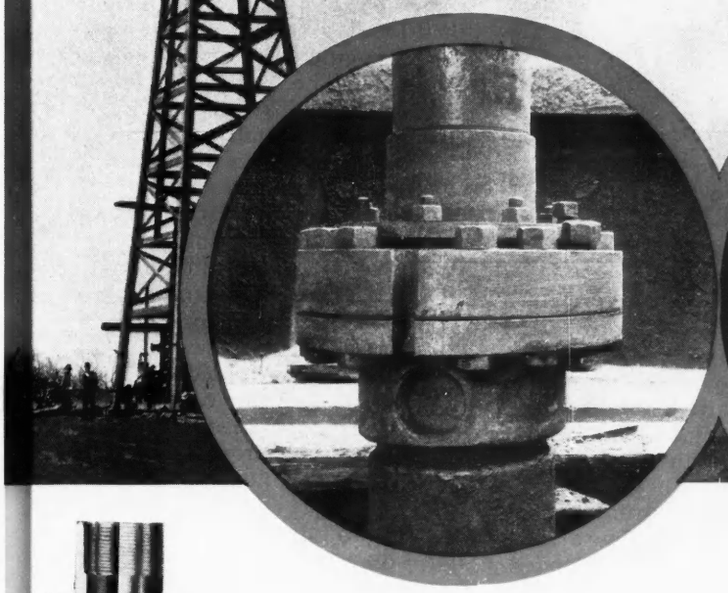

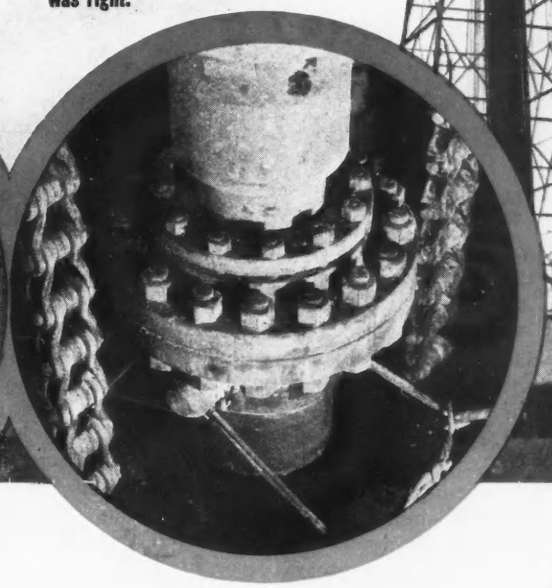

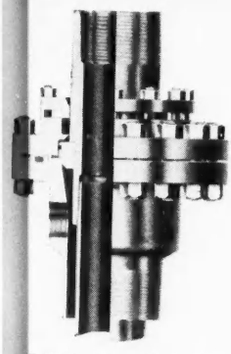

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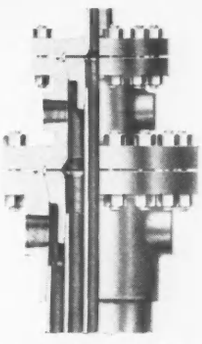

Mandrel Suspension Type

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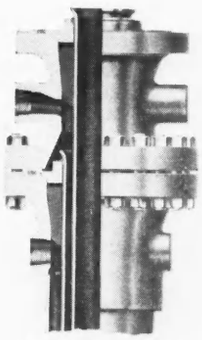
SPLIT RING . . . RECESSED COUPLINGS SUSPENSION TYPE

This original Rector type of suspension, found only in RECTORHEADS, incorporates the advantages of both the slip and mandrel types of casing suspension, plus unique advantages not found elsewhere. The two chief advantages, namely, repackable under pressure and elimination of pressure equalization, are proven by 10,000 RECTORHEAD installations and 10 years of unfailing service. Never in these 10 years has a well, equipped with a RECTORHEAD, been lost.

SLIP SUSPENSION TYPE

This slip type suspension RECTORHEAD was designed for operators preferring this particular method of casing suspension. The pressure seal is simple, safe and dependable, entirely free from complications . . . made possible by the patented application of the seal ring. Four parts only comprise the unit: slips, body, welding ring, and seal ring.



Slip Suspension Type

MANDREL SUSPENSION TYPE

This RECTORHEAD type uses a mandrel, or bowl, as a suspension, together with the patented application of the sealing and hold-down ring. It gives the user a casing and tubing suspension head . . . in combination (flanged), or singly, as desired. It is simple in design, easily installed, safe, and dependable, and is extremely popular for wells of moderate depth, pressure and volume. Like the recessed coupling in the original RECTORHEAD type, the mandrel is furnished either threaded, or for welding.

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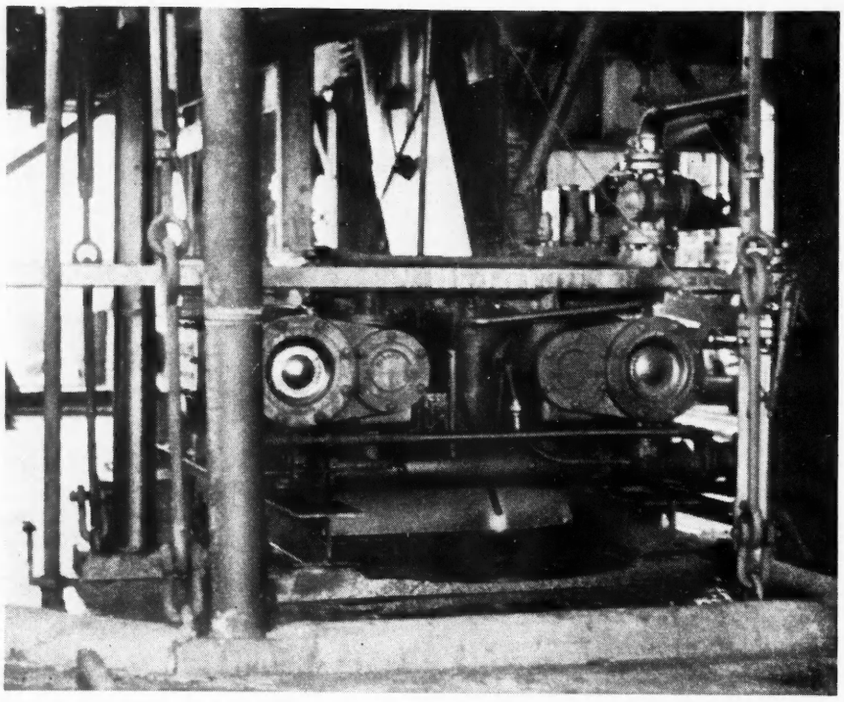

High rotating speeds are being attained by Superior Oil Company through use of this 12 x 12 horizontal twin steam engine, located under the derrick floor and driving the rotary table above by chain and jack shaft.

mental manner, but regards 300 to 350 r.p.m. as the present practical limit with average heavy equipment and a 350-pound steam pressure.

Record rotating speeds usually have been established with a prime mover used exclusively for driving the rotary table. Both steam engines and electric motors have been used to eliminate the draw works as the driving medium for the rotary table. Where ordinary 12 x 12 steam engines are used, they are generally located on the ground level below the derrick floor, the drive by chain obviously being upward at a slanting angle to the table. Vertical "twin" steam engines have been used effectively for driving the rotary table, the usual position for engines of this type being on the derrick floor.

Conventional draw works are not suited to drive the rotary table at the maximum speeds often attained, while the rotary machines themselves have a maximum rating of 350 to 400 r.p.m. Consideration of these limitations has influenced several operators toward a conservative program calling for maximum rotating speeds between 300 and 350 r.p.m.

Unbiased California operators have been attempting to determine the best rotating speeds for various formations. Attempts to rotate at excessive rates under questionable conditions has prompted both the formations and equipment to "talk back" to the operators. The company with the straightest hole and best equipment has been able to rotate faster than the operator with more generous tolerances and outmoded equipment. There is no doubt but that rotating speeds of 500 r.p.m. and above must be accompanied by the use of suitable equipment and an almost straight hole.

The Gulf Coast and Mid-Continent have not attempted to duplicate California rotating speeds, the range with most of the major operators being from 85 to 150 r.p.m. Practically no use of rapid rotation has been made in some of the most favored areas along the Texas and Louisiana coast lines, although separate drives to the rotary table are commonly used. Several drilling contractors use rotating speeds up to 200 r.p.m.

Out of attempts to attain higher rotating speeds will come information to guide the operator in every formation. The indicated critical rotating speed, as observed by a major California producing company, is 800 r.p.m. Such a safe operating maximum apparently is half of the absolute maximum believed possible with short drill pipe strings. A drilling bit was rotated at 1500 r.p.m. while making hole with a special hydraulic drilling outfit, but the conventional type rock bit proved it was not designed for such speeds. The bit was rotated by hydraulic power on bottom and no conventional drill stem was used. The experiment was a test only for the bit.

Superior Oil Company sharply reduces the rotating speed in hard formations. Bit wear is excessive when maximum rotating speed is attempted in rock, and it is often necessary to reduce the rotating speed by half under hard drilling conditions.

This company uses a conventional 12 x 12 twin horizontal steam drilling engine for driving the rotary table. The engine is placed under the derrick floor and the drive is by chain and jack shaft. A direct drive was use originally but the arrangement overtaxed the engine. High sustained rotating speeds are practical only where satisfactory drives are provided.

The increase in rotating speed has started experimental work among most of the large operators who have not yet adopted the practice. A large operator recently announced that his old rotating speed of 125 r.p.m. had proved the most violent vibrating point on the entire speed scale between 75 and 500 r.p.m. Every operator finds that a radical increase in rotating speed is possible only where the necessity for a straight hole and suitable equipment is recognized. A sudden desire to double the rotating speed probably will not give the desired results, where consideration for the other accompanying factors are ignored.

The use of high rotating speeds has been an earnest desire to develop drilling practice that will make hole more rapidly. Perhaps a few California operators have passed the necessary limits, but in other districts advances probably are needed. Various economic and physical factors affect a sharp increase in rotating speeds, and many districts are content to continue the old practices. Rotating speeds of 750 r.p.m. are possible.

Weight On Bit

Weight required on the bit has long been a controversial subject. New conceptions of weight have been gained during the past two years, however, and with increased rotating speeds has come more

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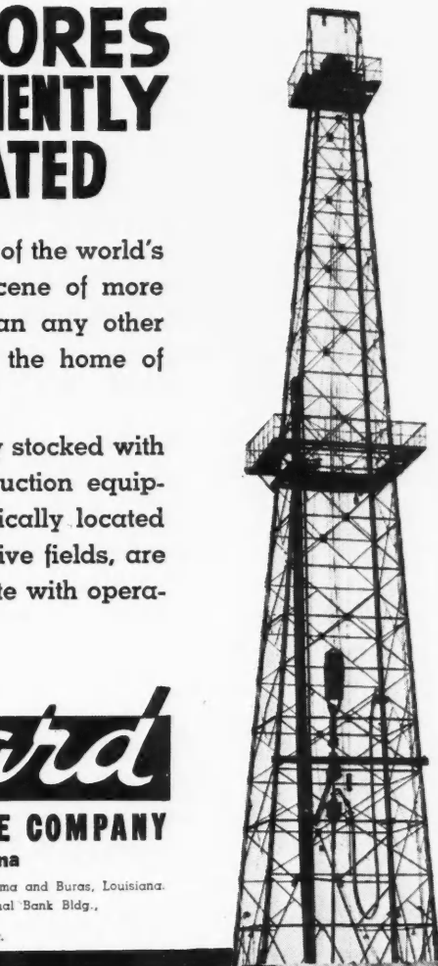

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than a corresponding increase in the weight carried. No point can be gained by rapid rotation unless it is accompanied by a gain in drilling speed and a straighter hole than could be made with the slower rotating speed, leaders in the "more-speed-more-weight" movement contend. During the period of most rapid rotation in favorable formations, a California operator drilled with 12 points of weight, or about twice the weight formerly used with old rotating speeds. A rotating speed of more than 500 r.p.m. kept the hole almost straight, despite such a weight on the bit.

Drilling and Exploration Company, a leader in research and experimental drilling operations in California, has done much constructive work in an effort to determine the correct weight to carry on bit at various rotating speeds. This company carries from 6 to 8 points of weight while making hole at the maximum rate in favorable formations. From 1 to 2 points of weight is used to straighten the hole. Excessive weight is never knowingly used while drilling hard formations.

Superior Oil Company drills with 6 to 10 points of weight while rotating at high speeds in favorable formations. Soft formations that "fan out and wash out" easily will give way to the bit satisfactorily while drilling with considerable weight. Rapid rotation gives an excellent cutting and reaming action in soft formations, but proper use of slush pumps is a necessity. Use of heavier drill collars, discussed later in this article, was a factor in establishing new drilling records with 8 to 10 points of weight.

Union Oil Company has been attempting to determine the weight actually on the bit, rather than the indicated weight at the surface. In its experiments this operator has used "tons" rather than "points" as a unit of weight. Weight applied to the bit during rapid rotation has been from 5 to 15 tons, depending on the formation.

A major California operator drills with 6 points of weight while rotating at 200 r.p.m. in favorable formations, and 8 points while rotating at 250 r.p.m. Other companies drill with 5 to 8 points of weight with an average rotating speed of 225 r.p.m.

Operators in every district have been studying the relationship between weight on bit, speed of rotation, drilling time and verticality of hole, but most of the experiments have stopped almost in the beginning. When the driller of 12 years ago needed to make hole more rapidly, he merely increased the weight on the bit. Some adjustments were made in rotating speed and the volume of mud circulated, but the changes were not in proportion to the increased weight. The net result often was a crooked hole. High rotating speeds used in California have been coordinated with increased weight to make straight hole at a rapid rate, where weight alone would not suffice. Weight on the bit should not be feared if it is controlled properly. Control of weight will be discussed briefly in another paragraph.

Gulf Coast operators carry from 3 to 6 points of weight on the bit while rotating at various speeds between 85 and 200 r.p.m. One company favors a weight of 3 points on the bit and a rotating speed of 150 r.p.m. while drilling in soft formation, and another operator places as much as 4 points on the bit with a rotating speed of 125 r.p.m. Drilling contractors use up to 6 points of weight while making hole at the maximum rate in favorable formations.

Long Drill Collars

The use of long and heavy drill collars to control the weight and place it near bottom has been a major factor in the success of rapid rotating practices and application of increased weight. It has been strongly indicated that weight formerly shown by the drill pipe was not necessarily on bottom. Where a liberal tolerance from vertical was allowed, much of the weight probably was against the hole in numerous places, due to the "bowed" condition of the drill pipe. Increased weight simply tended to press the drill pipe more firmly against the hole at several points, one engineer contends.

Union Oil Company of California has been using 240 feet of 8⅝-inch drill collar while drilling with a 12¼-inch bit. The company has determined the approximate weight each bit will withstand before failing.

The use of long and heavy drill collars theoretically places only the weight of the drill collar on the bit while drilling, but the exact position of the drill pipe in the hole is not known. Superior Oil Company has used as much as 360 feet of drill collar—six 60-foot drill collars together—in Rio Bravo field operations. Such an arrangement theoretically permits the drill pipe to function only as a power-transmitting medium by remaining in tension. There is no doubt but that the old "cramming" action on the drill pipe to develop weight imparted a kinking and bowing action that gave trouble. Even the use of 240- and 360-foot drill collars has not eliminated all whipping action near bottom. Reamers and guides near bottom have given good results. The greater rigidity of the long drill assembly is an aid in straight drilling because of its reduced tendency to bend under compression.

The so-called "lead" drill collars are not made of lead in the strictest sense. They consist principally of lead tubes that are placed around small drill collars, plus an outer steel shell that fits over the lead sleeves. The idea is to give the greatest possible weight near bottom.

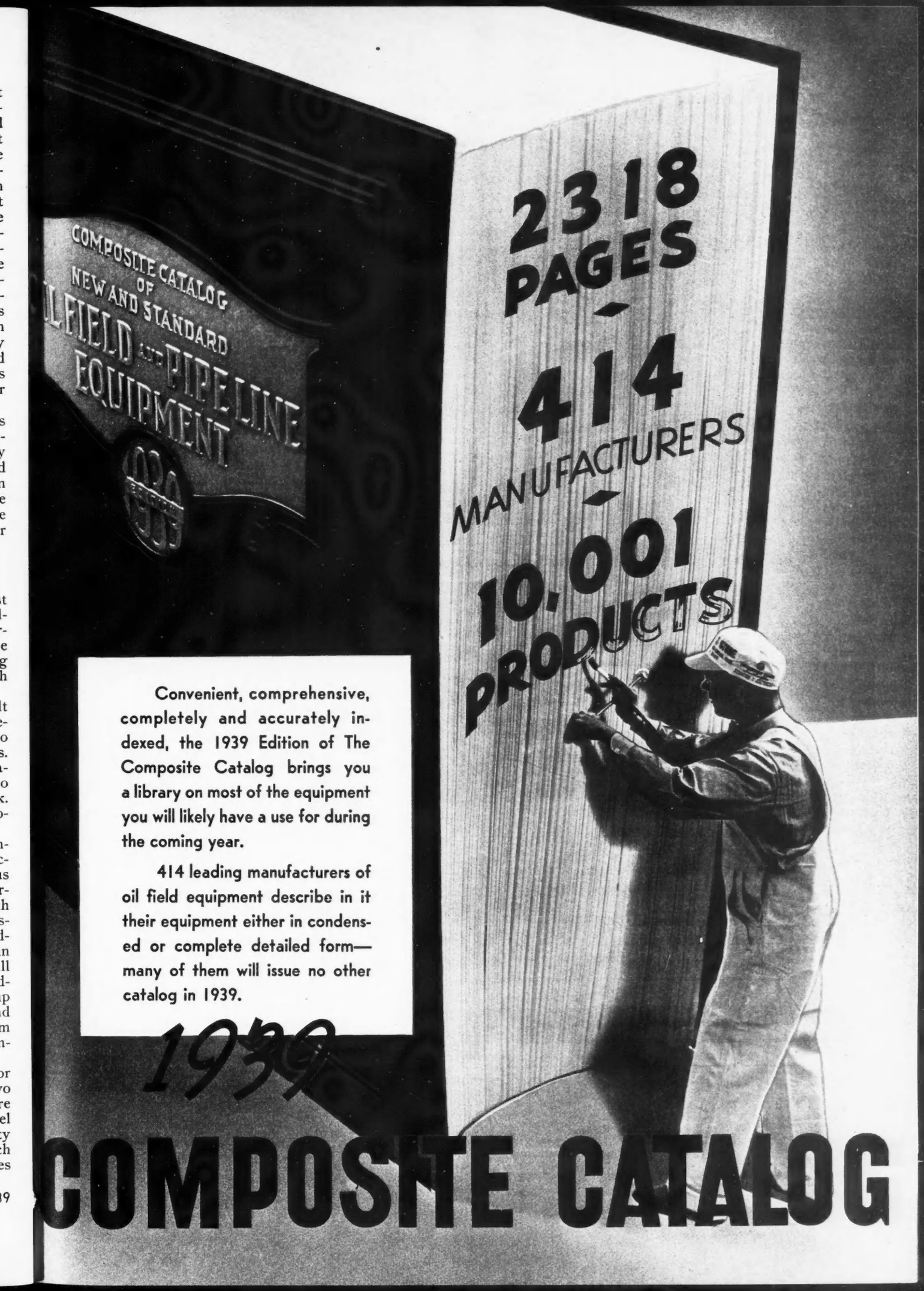
Mud Control Important

Mud control is one of the most vital factors involved in deep drilling operations. Several tricky formations, including troublesome shales in every major producing area, now are drilled easily with suitable muds.

Poor mud used in one well built up such a thick wall through dehydration that it was impossible to come out of the hole to change bits. Gradual loss of water to the formation allowed the dehydrated mud to build a thick wall as hard as rock. The restriction finally affected rotation of the drill pipe.

Mud control involves the maintenance of a drilling fluid that functions satisfactorily without serious change from heat, pressure or formation. The principle deals with balancing the colloidal characteristics of the mud with its wall-building characteristics and weight in such a manner that cuttings will be removed from the hole as rapidly as they are disengaged, wall up the hole with a thin filter cake and in turn keep the loss of water from the mud to the formation to a minimum quantity.

High temperatures make for difficult mud control from two sources. Elevation of temperature increases the viscosity and gel strength of the mud. The viscosity of water at temperatures at which it is subjected in the deeper holes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is from ¼ to ½ of the viscosity shown in the shallower parts of the hole. This means that filtration of water from the mud at high temperatures will be up to twice the rate of filtration at low temperatures. The deposition of the filter cake on the walls of the hole is constantly proportional to the rate of filtration of the water from the mud.

Chemicals, thinners and conditioners are sharply affected by elevated temperatures. Frequent treatment of the mud is a necessity under difficult drilling conditions below 8000 feet, and almost continuous addition of chemical mud thinners may be required to hold a viscosity and gel strength within desired limits.

Special muds and weight materials are extensively used in all deep drilling districts. Ordinary muds are too light where abnormal pressures are encountered. The general adoption of field testing equipment reflects the general acceptance of more accurate technical mud control.

Muds which weigh from 11 to 17 pounds per gallon are required in deep drilling operations. Where abnormal pressures are not indicated, mud of nominal weight is used near and in the producing formations by several operators. A lighter mud was used below 13,000 feet than between 10,000 and 13,000 in drilling a record deep well in California. At Old Ocean, Texas, the mud used for drilling the lower portion of the hole is only two pounds heavier per gallon than that required to balance or offset the indicated bottom - hole pressure. The lightest mud giving a safe working margin is the best weight to use.

The circulation of drilling mud depends largely on the disposition of the operator and the whims of the driller. Rapid rotation and increased weight on the bit have forced the use of larger slush pumps and increased mud circulation. While rotating at 400 and 500 r.p.m. it has been necessary to operate the slush pumps at full capacity to get best results. While drilling at a fast rate in favorable formations, the slush pump is an important hole-making medium. Superior Oil Company uses 15 x 9¼ x 22 slush pumps with its largest drilling outfit, the combination being the largest yet manufactured.

Controlled Vertical Drilling

With deeper drilling has come an increased tendency to keep the hole straight. Controlled vertical drilling is a necessity where high rotating speeds and increased weight on the bit are employed. A new conception of "straight" holes has been gained by companies extending their rotating speeds to the limit, and the tolerance from vertical has been radically reduced.

Union Oil Company sets its surface casing in a hole that deviates less than one-half of one percent from vertical. Holes deviating more than this amount are straightened before casing is run and cemented. The company considers the top of the hole a "jig" or guide for the remainder of the hole. The average deviation from vertical of all deep holes drilled by this operator is not greater than one-half of one percent, perhaps the most exacting average on record. The nearer a hole approaches vertical the faster the drilling rate, where rapid rotation is desired. Union Oil Company checks the deviation with every connection in the upper part of the hole, and takes a record every 50 or 100 feet below 1000 feet. The hole is always checked at each formation change. A straight hole is the foundation upon which the company bases its deep drilling practices, and any definite inclination from vertical is corrected before it has assumed a dangerous drift.

Most of the major California operators have reduced the tolerance from vertical, and the old "three degrees or less" clause has become outmoded. A deviation of less than

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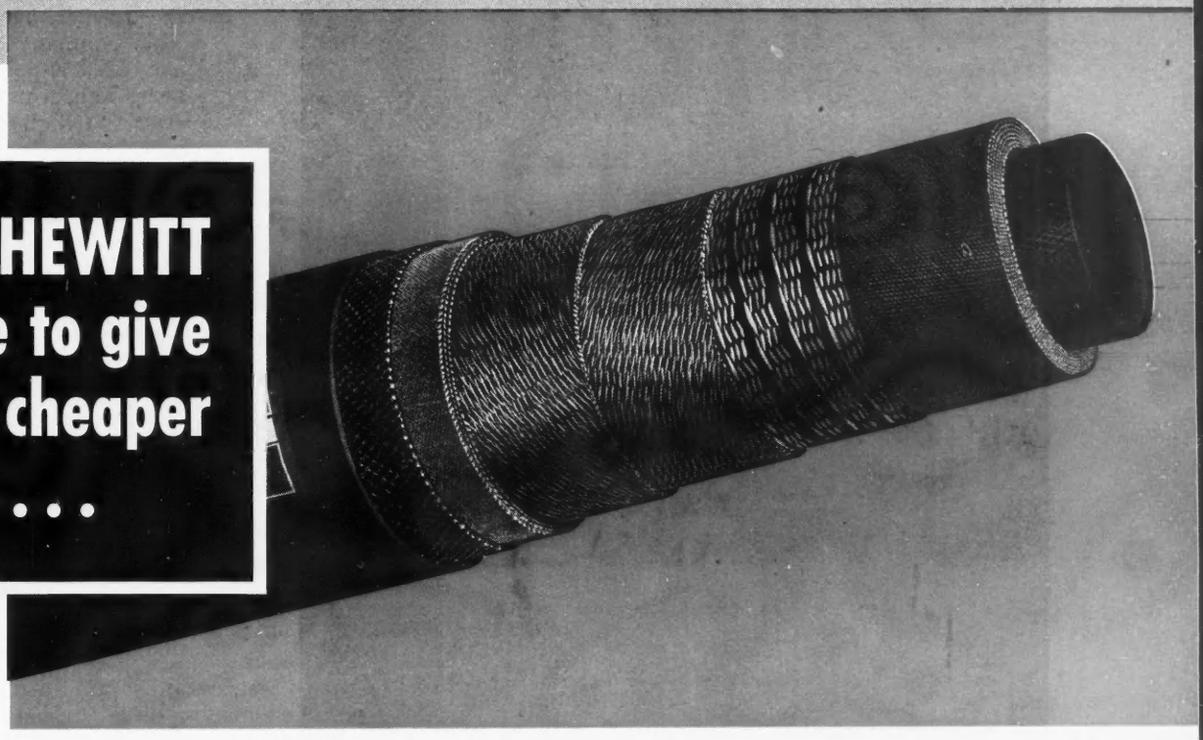

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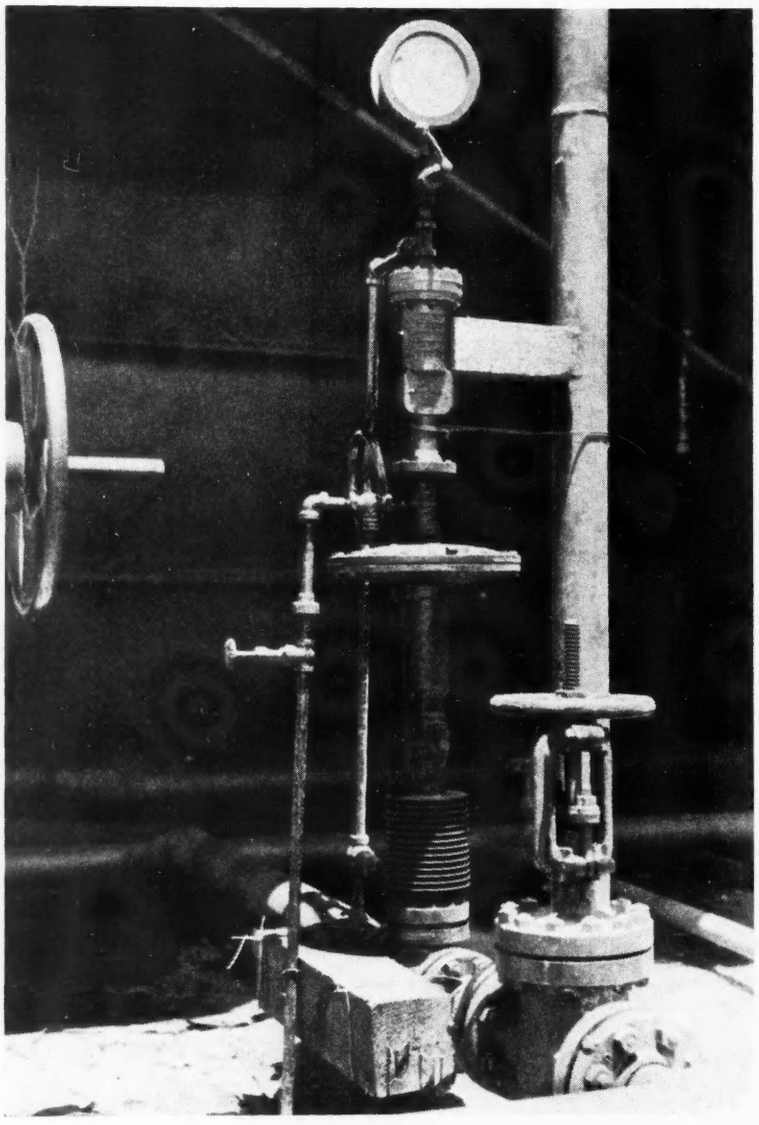

This regulator reduces the 500-pound steam pressure, used for the first time by a California operator, to 350 pounds for utilization in auxiliary equipment not suited to handling the higher pressure.

two degrees from vertical is the more general requirement.

Gulf Coast and Mid-Continent operators have lowered their tolerances from vertical, but they are more lenient than would be possible, were rapid rotation and increased weight on the bit definite requirements. The average Gulf Coast well is a long, wavy hole that wanders back and forth between vertical and three degrees from vertical. Where the objective formations are encountered at great depths, operators have reduced the tolerance from vertical.

Controlled directional drilling is a direct exception to the general drilling rule, but it has a definite place in oil field development. Operators desiring to develop leases under unusual surface hazards often find directional-drilling methods the most economical to use. As many as six wells have been drilled from a single foundation unit, the courses of the various wells having been deviated to develop a large acreage from a central point.

High Steam Pressure

The recent adaptation of 500-pound steam pressure to California drilling operations attracted wide attention. Use of five 130-horsepower boilers furnishes a 465° F. steam that is superheated to 650° for use in 22-inch slush pumps and a 15x14 twin drilling engine on the draw works. The steam pressure is reduced to 350 pounds per square inch for use in the auxiliary equipment, including the 12x12 twin horizontal engine driving the rotary table. Superior Oil Company is pioneering the use of 500-pound steam pressure, the increase having been a direct jump from the former 350-pound maximum. This company also pioneered the use of 350-pound steam several years ago, a pressure then considered too high by many operators who later adopted the practice.

The 500-pound steam pressure undoubtedly has several advantages over the lower pressures, but much of the equipment around a derrick is not suited to the new maximum pressure. A few operators continue to use a 250-pound steam pressure, but the 300- and 350-pound pressures are standard with many companies. The steam pressure trend is higher. In various other industrial applications, steam pressures of 1500 and 1600 pounds per square inch are used, but such installations are of a permanent nature.

Deeper drilling has not radically affected hole sizes in the different districts. A recent well in the Rio Bravo, California, field was drilled with 17½-inch hole to about 1800 feet, where 13 3/8-inch casing was cemented. A 12¼-inch hole was carried to about 8800 feet, and an 11-inch hole to 11,528 feet. A string of 7⅝-inch casing was cemented at 11,528 feet. Operators in every district are attempting to carry increased amounts of open hole.

Casing programs in several deep districts are interesting. Casing recently cemented in a Wasco, California, well included 13 3/8-inch at 500 feet, with 350 sacks; 9⅝-inch at 5500 feet, with 265 sacks; 7-inch at 12,000 feet, with 600 sacks; and a 5-inch liner at 13,000, with 60 sacks.

The record producing well in South Louisiana, completed at 13,333 feet, had 26-inch conductor pipe at 60 feet; 18⅝-inch at 310 feet; 13 3/8-inch at 3250 feet; 7-inch at 11,684 feet; and 5-inch liner at 13,333 feet.

Wire line sizes and combinations are generally selected to give a safety factor of 5, but during emergencies the safety factor is virtually ignored. A safety factor of five means that the maximum anticipated load is one-fifth of the breaking strength of the wire line. The number of lines strung should be determined by the anticipated load, and not by the desire to make the greatest block speed.

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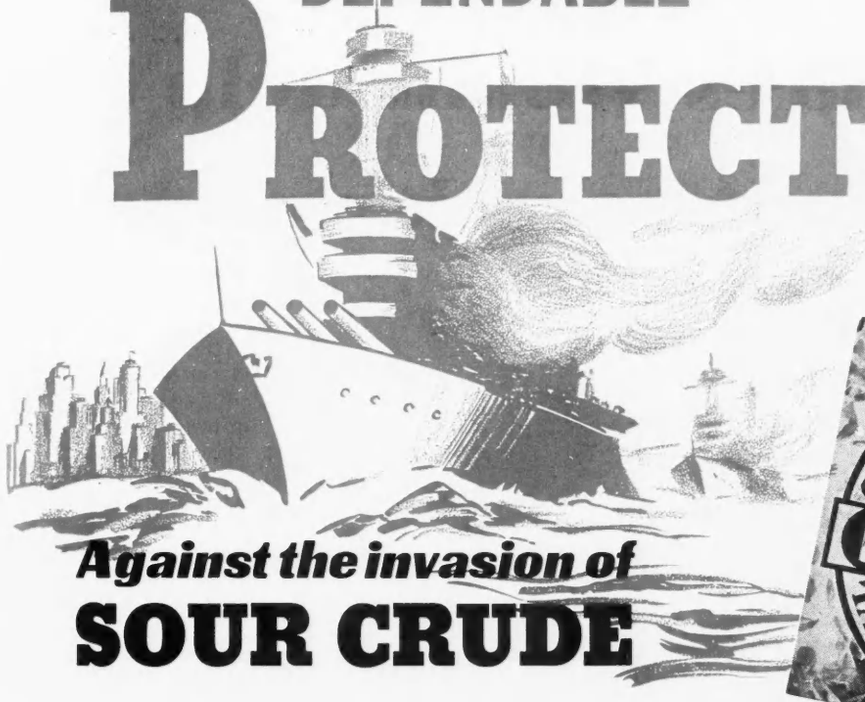

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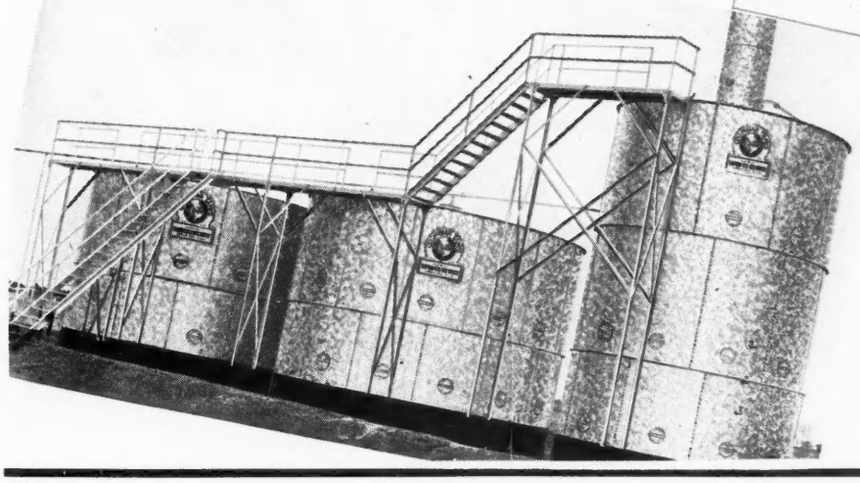

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Closer Determination of Pressures Would Help in Deep Operations

PRESSURES tend to increase as greater drilling depths are attained. While they maintain a fairly true rate of increase down to about 7500 feet, variations become more frequent and pronounced below that level, thereby accentuating the hazard of blowouts on deep operations.

Comparatively little study has been devoted to pressures encountered on drilling tests, although it is a topic that additional concerns might find practical and helpful. Determination of formation pressures during drilling operations, or at least approximation of such pressures, is beneficial where well control is difficult or where freak conditions are indicated.

Recognition of abnormal pressures before the well has become unruly offers several distinct advantages to the driller, and unless a close check of conditions is being maintained it is not infrequent that troublesome situations arise before the amount of pressures that have been penetrated are realized. The two essential requirements in controlling high pressures during drilling operations are blowout preventers and proper muds.

The blowout preventer is standard equipment on every deep test. But it should be seen that it is of sufficient size and strength to withstand the maximum anticipated pressure. The preventer should also be tested from time to time to see that it is in good working condition, and so the workmen will be familiar with its operation.

Mud should be of the proper weight and viscosity. This can be controlled by following the pressure trend and by frequent tests of the weight and viscosity of the mud to see that they are sufficient to control the pressure. High-density muds have been required to control pressures in many areas.

Flowing pressure of Old Ocean, Texas, wells was as high as 4000 pounds, and bottom-hole pressure approached 5000 pounds. The gauge shown here with a pressure of 3900 pounds is on a flowing well.

High water, gas and oil flows have been developed in a number of original tests in an area. It has been impossible to complete many of these tests, and it is probable that those completed successfully owe much to the recognition of abnormal pressures early in the completion stage.

Bottom-hole pressures encountered in formations producing oil, gas or water naturally vary considerably at given depths in the different producing districts due to local conditions, but above 7500 feet they approximate the hydrostatic head of water plus about 7½ percent. A column of fresh water exerts a pressure of about 0.433 pounds per foot, or 433 pounds per hundred feet. Thus the bottom-hole pressures normally expected in a typical water-drive field producing from 7500 feet should be about 3400 pounds. Actual bottom-hole pressure determinations in typical shallow fields have checked closely with this scale. If calculated on the above basis, bottom-hole pressures at 10,000 feet should average 4650 pounds, but are apt to show greater discrepancies.

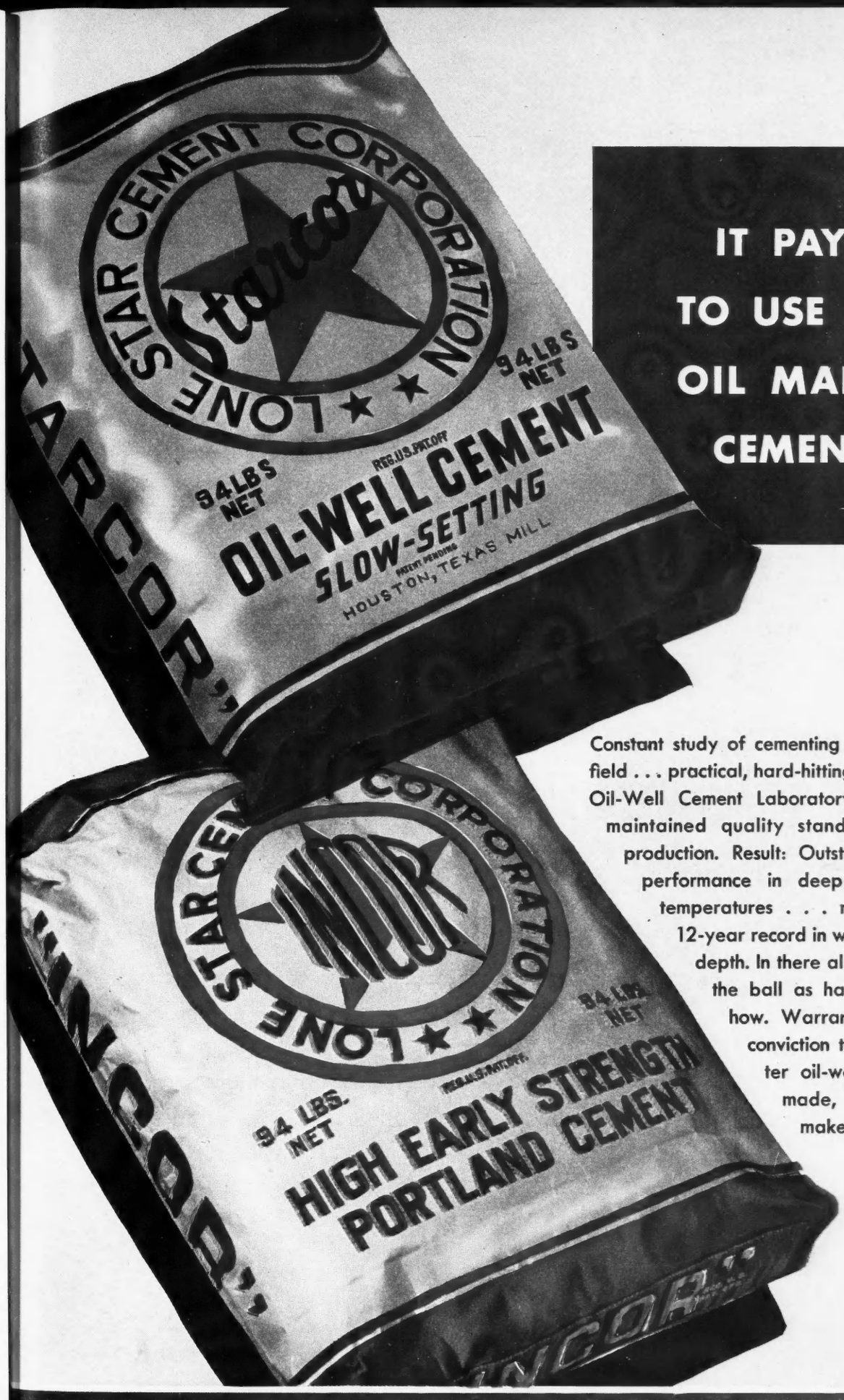
The true "water head" scale does not hold in many fields, as abnormal or freak pressures are often encountered. This is especially true where gas is heavily involved or extreme depths are attained.

Weight of the overburden, nature of the structure, and other factors affect pressures in formations carrying either gas or fluid, and sharp variations from the so-called "normal" hydrostatic pressure line have been noted in every district. A deep producing field in South Louisiana showed an excessive bottom-hole pressure in a zone at 8200 feet and slightly less than a normal pressure at 11,600 feet, a freak reversal from the expected trend.

Abnormal Pressures

Abnormal formation pressures are encountered at various levels, but they become more frequent and pronounced below 7000 feet. In 25 Gulf Coast fields wells completed between 3000 and 7000 feet showed bottom-hole pressures corresponding to the hydrostatic pressure gradient of salt water containing 8 to 10 percent solids, according to G. E. Cannon and R. C. Craze. This average indicated pressure approximated 0.465 pounds per square inch per foot of depth, as compared with a pressure of 0.433 pounds exerted by pure water. Below 7500 feet the average formation pressure in Gulf Coast fields tends to increase at a more rapid rate than is shown for similar depth changes above 7500 feet.

Few sub-normal pressures have



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been encountered at any depth. The pressure gradient is almost a straight line from the surface to 7000 feet, while below 7500 feet the average formation pressure probably exceeds the 0.465 pounds per square inch per foot of depth that is generally shown above 7000 feet.

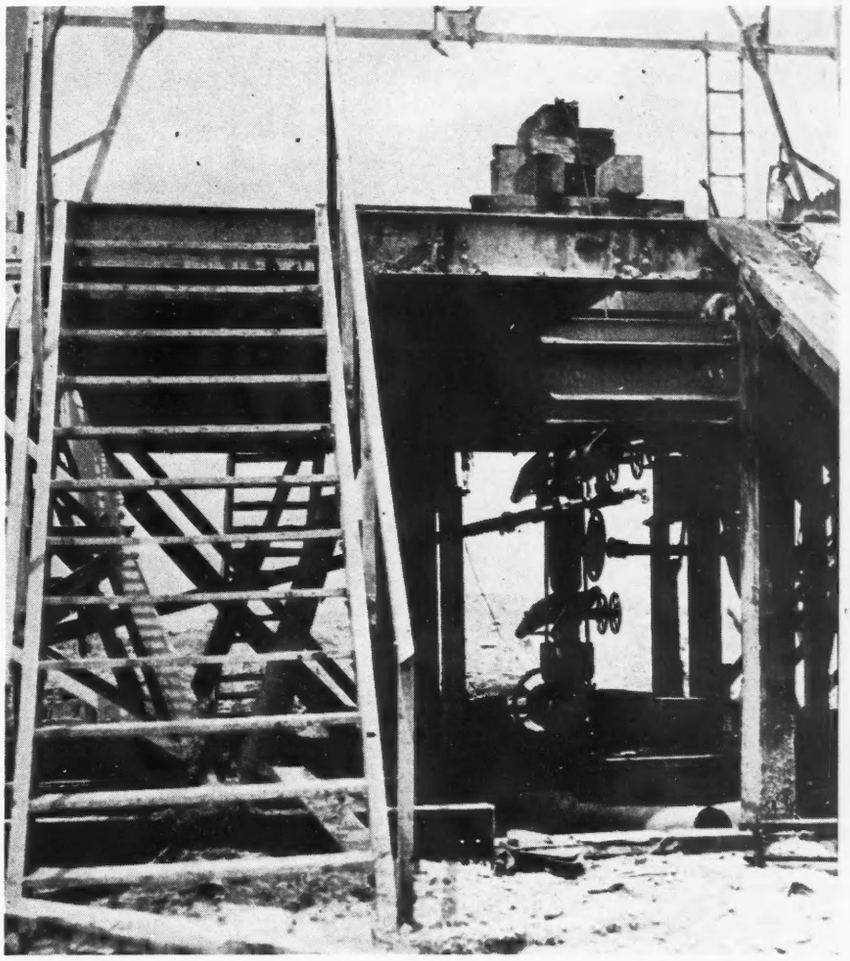
Indicated bottom-hole pressures of 30 to 65 percent above "normal" have been recorded in several areas, and one South Louisiana well drilled to 12,216 feet showed a bottom-hole pressure so high that 16-pound mud was required to prevent a blowout. The indicated bottom-hole pressure in this well was 8000 pounds per square inch, or about 40 percent above the pressure ordinarily expected.

Approximations obtained in more than a dozen wells drilled to depths of more than 10,000 feet strongly support the belief that the pressure gradient ceases to be a straight line below 7500 feet, averaging considerably more than 0.465 pounds per square inch per foot of depth. A salt water flow encountered below 10,000 feet in a Lake Borgne, Louisiana, well showed an abnormal pressure that quickly dissipated the mud.

Pressure in East Texas

The original bottom-hole pressure in the East Texas field was very close to the hydrostatic pressure of the salt water acting on the producing zone, or around 1625 pounds per square inch. This pressure was not checked carefully or verified in the beginning, but it approximated 0.46 pounds per square inch per foot of depth. The similarity of the original bottom-hole pressure and hydrostatic pressure of the salt water acting on the Woodbine sand has been used by many engineers as the chief argument favoring the "water drive" theory.

Bottom-hole pressures have been watched closely in this field, and its decline from the original pressure has been an interesting phase of development. The withdrawal of 1,300,000,000 barrels of oil in nine years apparently has been much more rapid than the movement of water into and against the producing formation. This field is one offering direct evidence of hydrostatic influence, since the Woodbine sand outcrops west of the field, carries water, and dips to 3600 feet to account for the oil accumulation. It hardly seems logical that the similarity of bottom-hole pressure and hydrostatic pressure was accidental, since other shallow fields show the same pressure ratio.



The discovery well in the Palacios, Texas, field, where an indicated bottom-hole pressure of 6500 pounds and an actual flowing pressure of 6200 pounds were subsequently developed at 9275 feet. This is believed to have been the highest flowing pressure ever developed.

Freak or abnormal bottom-hole pressures have been explained by various theories, but several factors probably are involved. Transmission of a portion of the overburden, or earth pressure, to fluids and gases in the formation is possible, where limited permeability and slight earth movements combine to form a "squeeze." Specific gravity of the earth is about 2.2 and through certain trapping influences fluids or gases might not be free to escape excessive pressure from formations. A very slight shifting action of the earth might sharply affect the pressure in a formation well filled with fluid, where low permeability of the surrounding formations is a factor. Additional weight has been lent to this theory by the rapid reduction of pressure in water formations after blowouts.

Abnormal pressures have been developed in "pockets," sand layers of small area, and in formations separated from major outcrops that might relieve the pressures. These isolated sand lenses may contain either fluid or gas.

Freakish Conditions

High formation pressures encountered in the Clinton, Texas, field reflected a freakish condition that was not satisfactorily explained. One well, when brought under control, recorded a shut-in pressure of 5100 pounds and an indicated bottom-hole pressure of 6200 pounds at a depth of less than 9000 feet. The first well drilled by Stanolind Oil & Gas Company blew out, but the pressure dropped rapidly after the well was brought under control and allowed to produce through the drill pipe. The indicated bottom-hole pressure in

this area was about 50 percent above that normally expected at 8800 feet.

Several theories were advanced to account for the abnormal pressures at Clinton. One theory, not fully accepted, contended that the high-pressure shale section below 8000 feet originally was located at a much greater depth. When this section was lifted up, it was sealed and impervious enough to retain most of its original pressure. Another theory suspected a connection between the deeper formations and the 8100-foot stratum. Decline of the pressure was a blow to this theory.

Continental Oil Company found an abnormal bottom-hole pressure in its wildcat test near Abbeville, Louisiana, and at 12,216 feet 17-pound mud was used to keep the well under control. The indicated bottom-hole pressure of 8000 pounds was about 45 percent above the expected pressure.

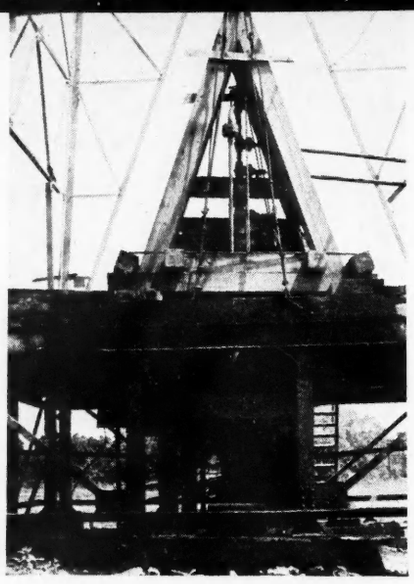
Compaction of earth strata is believed to be a reasonable explanation for excessive pressures in several deep areas. Weight of the overburden is too great for normal support below average drilling depths, and a portion of this strain is transmitted to the fluid or gas in the formations.

A connection between very deep formations and shallower zones has been suspected, but open fissures filled with gas are a doubtful quantity. A sustained vertical connection between formations encountered at great depths and shallower formations is a possibility, but water encroachment in gas channels should be expected. Rapid dissipation of excess pressures in many wells has done much to discourage the belief that a direct connection often exists between very deep and shallower formations.

The recovery and examination of pieces of formation under abnormal pressure indicate a shrinkage in porosity that has raised the pressure of fluids or gases in such sands, but some of the most troublesome water zones have shown a normal porosity.

Bottom-hole pressures measured or indicated in Kansas, Oklahoma, California, New Mexico and the Rocky Mountains average between 0.45 and 0.50 pounds per square inch per foot of depth for the ordinary drilling depths.

Excessive pressures have not been restricted to deep formations in several districts. North Texas,



This well, first producer at Clinton, blew out when an abnormally high pressure was encountered below 8000 feet.

Wyoming and California producing districts have shown pressures above those normally expected, where maximum drilling depths were 7000 feet. Low permeability of formations surrounding the sands encountered apparently was a factor in the abnormal pressure conditions.

A well drilled to 9275 feet in the Palacios, Texas, field by Sun Oil Company showed an indicated bottom-hole pressure of about 6500 pounds, or around 48 percent above that normally expected. The actual flowing pressure of this well was 6200 pounds, probably the highest ever recorded on a production choke. The flowing pressure gradually dropped, but remained above 5000 pounds for some time. This field produces a light, gassy crude.

The La Belle field, near Beaumont, Texas, was one showing abnormal bottom-hole pressures at several depths below 8000 feet. Only approximations were obtained, but action of the drilling mud indicated a formation pressure of 35 percent above normal at 8600 and 10,100 feet. One well blew out with heavy mud in the hole. This field also produces a light, frothy oil and shows a high gas yield. The action of the producing formations in this field and in other fields producing excess gas tend to support the theory that the bottom-hole pressures below 8000 feet will be substantially above the average per foot of depth for those above 7500 feet. Since only approximations have been obtained in several of the deepest drilling districts, it is not possible to project the pressure gradient to depths below 10,000 feet.

The use of comparatively light drilling muds to control deep producing formations in California points to normal bottom-hole pressures in the average deep field. At Rio Bravo, a 11,400-foot field, control of the producing formation is not difficult with medium-weight mud, indicating a normal bottom-hole pressure. In the Wasco field, deepest producing area, Continental Oil Company used 80- to 90-pound mud from the surface to 5500 feet, 75- to 85-pound mud from 5500 to 9700 feet, 95- to 102-pound mud from 9700 to 11,584 feet, and 66- to 70-pound gel mud from 11,584 to 15,004 feet. Successful penetration of two oil zones below 13,000 feet while using light mud indicated a normal bottom-hole pressure in the record producer. Use of 70-pound (per cubic foot) mud gives a hydrostatic pressure of only 0.486 pounds per square inch per foot of depth. Such a mud is satisfactory in certain California areas, but it would be considered too light on the Gulf Coast.

Several blowouts in Gulf Coast fields should have been attributed to use of the wrong muds, rather than to light muds. Rapid dissipation of poorly conditioned muds has been fatal in many gas strata that probably showed little more than normal pressures.

An unusual demand for weighted mud was met in the South Crowley, Louisiana, field, where an indicated bottom-hole pressure of 7700 pounds per square inch at 10,000 feet was developed. This pressure was equivalent to that produced by a column of mud weighing 14.8 pounds per gallon. The mud finally used produced a hydrostatic pressure of about 500 pounds per square inch above the indicated formation pressure.

Where gas or water is involved in virgin formations, the bottom-hole pressure may be considerably less than that indicated by action of the mud. Rapid dissipation of mud and a threatened blowout can occur when poorly conditioned drilling fluid mud of adequate weight encounters strong gas or water flows.

The Convent, Louisiana, field, a new producing area, showed a bottom-hole pressure of 5400 pounds per square inch at 8045 feet. A formation pressure of more than 0.67 pounds per square inch per foot of depth indicates that the increase in bottom-hole pressure below 7000 feet will not be proportional to the depth increase in fields along the Gulf Coast.

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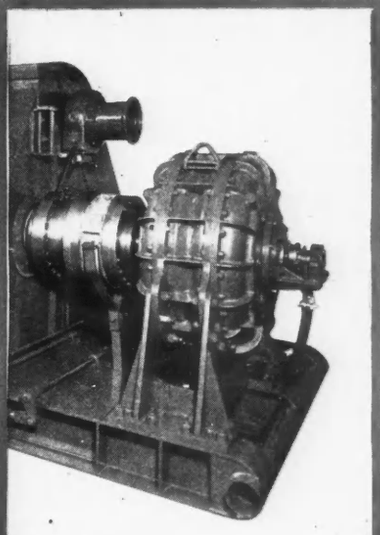

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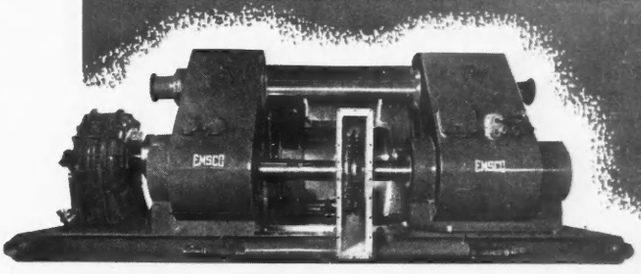

Rear view of drawworks showing built-in snout for oil bath engine drive guard —a part of the drawworks pressure-spray lubrication system.

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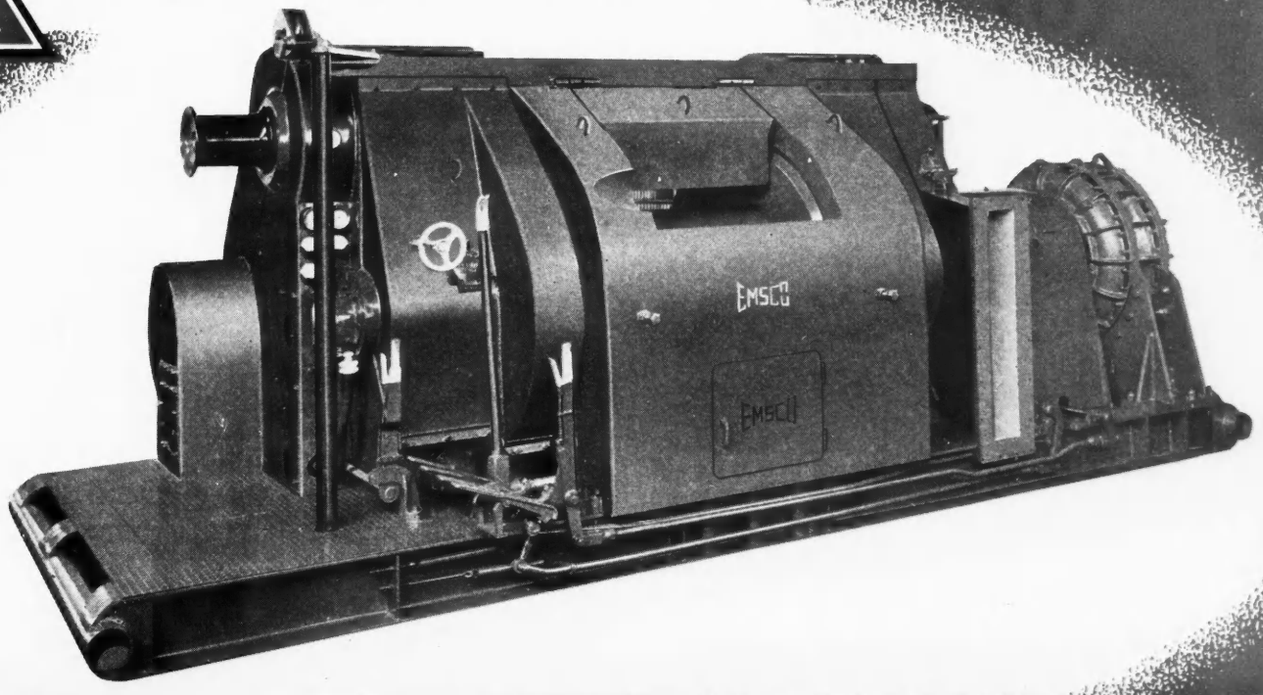

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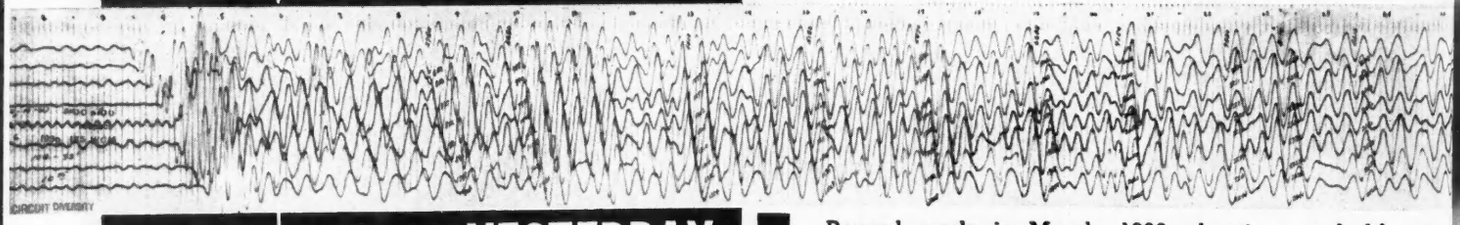
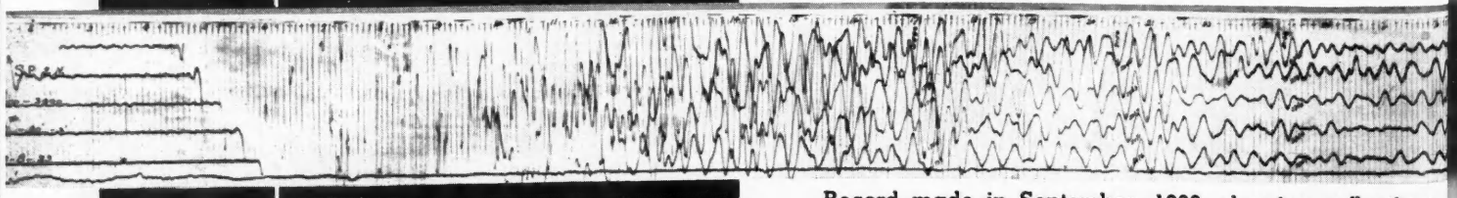


YESTERDAY

Record made in March, 1939, showing workable reflections from 11 beds.



Record made in September, 1933, showing reflections from 3 beds. Note correlation of the two records.

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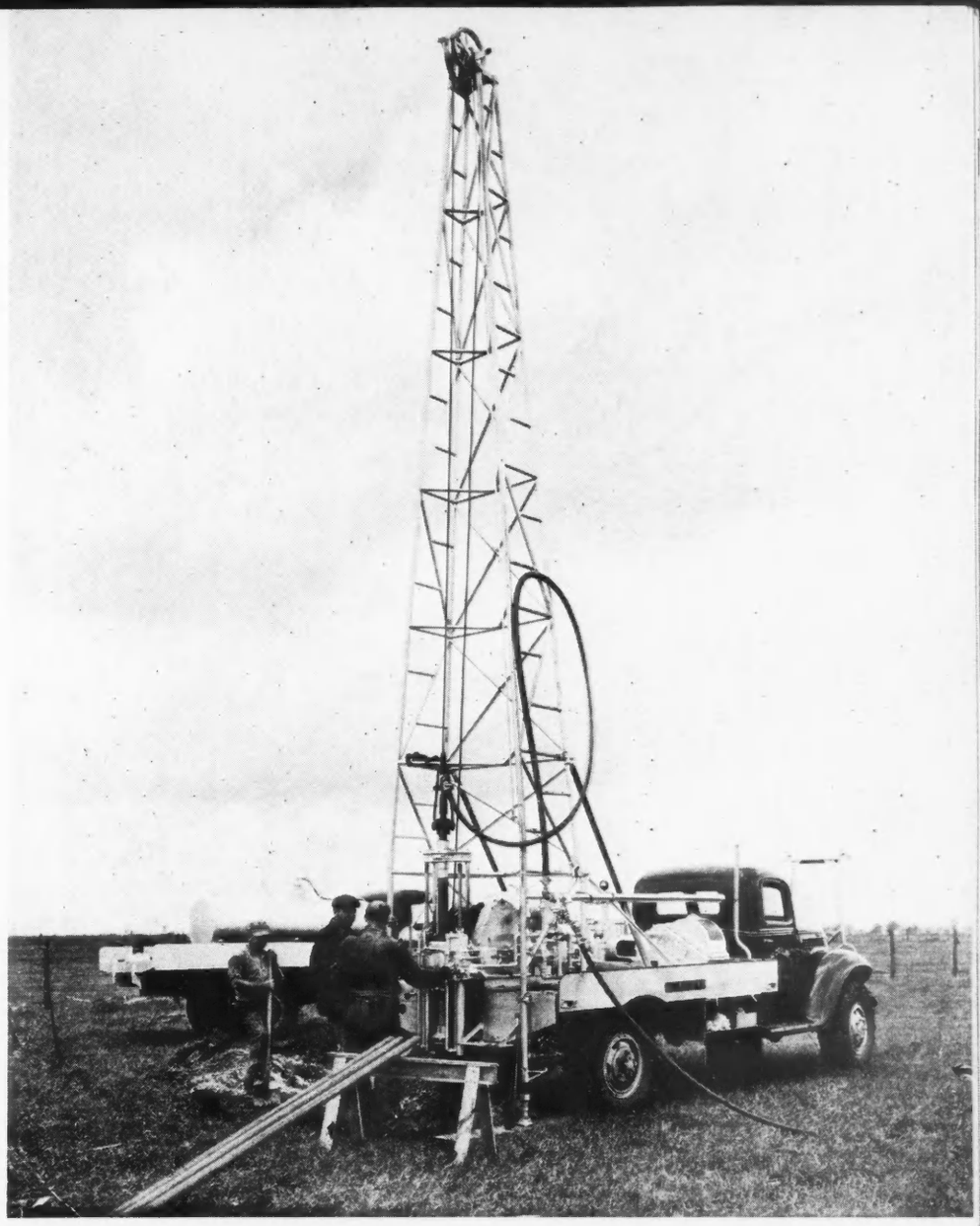

Deep shot holes are rapidly drilled with this portable outfit.

Far-Reaching Prospecting Advancements Presage Future Discoveries

THE science of prospecting for oil is a highly vital phase of the petroleum industry steadily growing in importance as it becomes necessary to discover larger numbers of new fields to meet the constantly expanding rate of consumption that has been so characteristic of the history of petroleum.

Since the industry has depended to a very large extent upon finding new producing sources at constantly increasing depths to accommodate gains in consumptive demand, and since it continues to probe deeper and deeper for production, the question of its ability to find new pools at levels deeper than those in existence today naturally arises.

There need be little worry on this score, for deep prospecting appears to be ahead of both the drill

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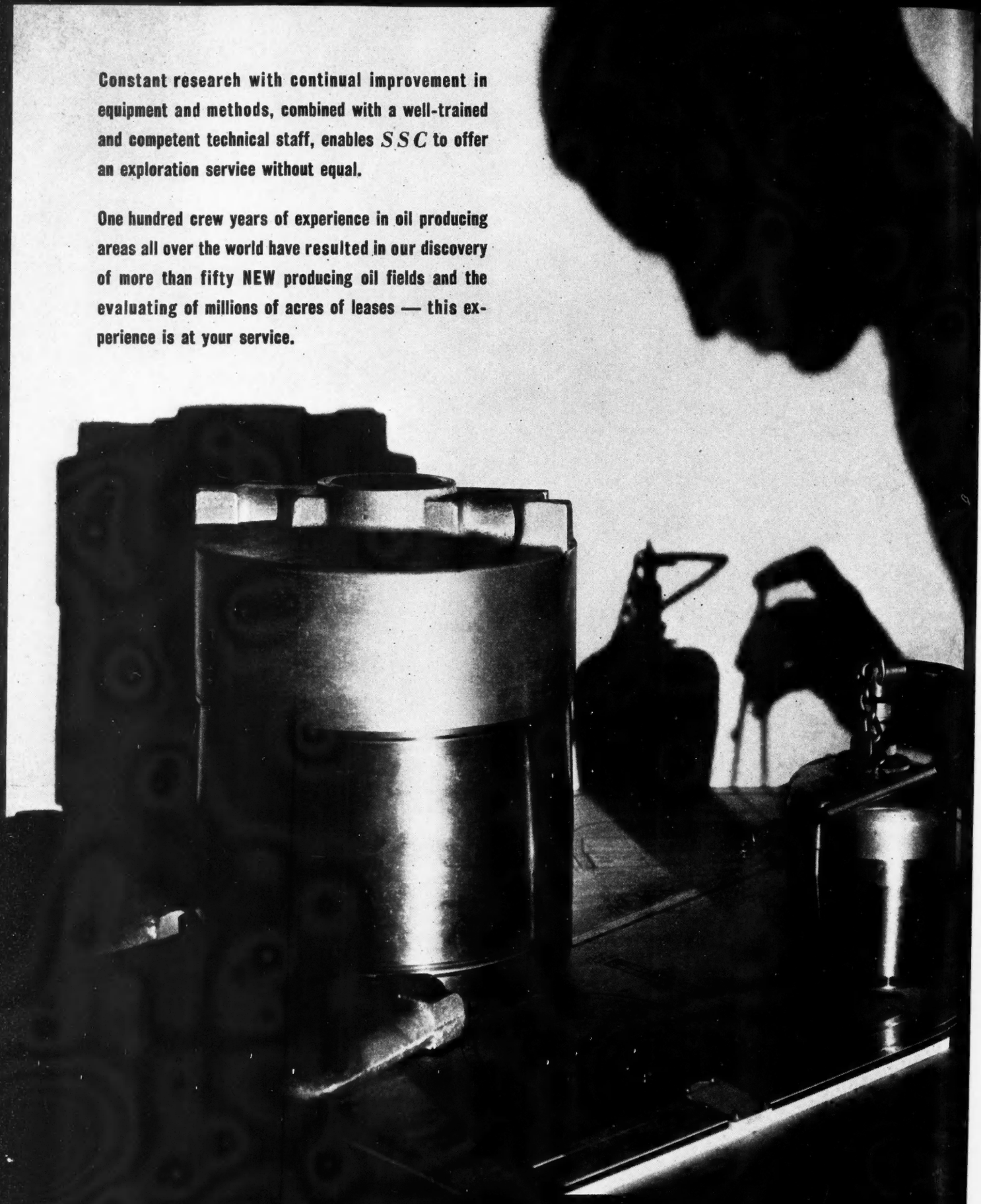

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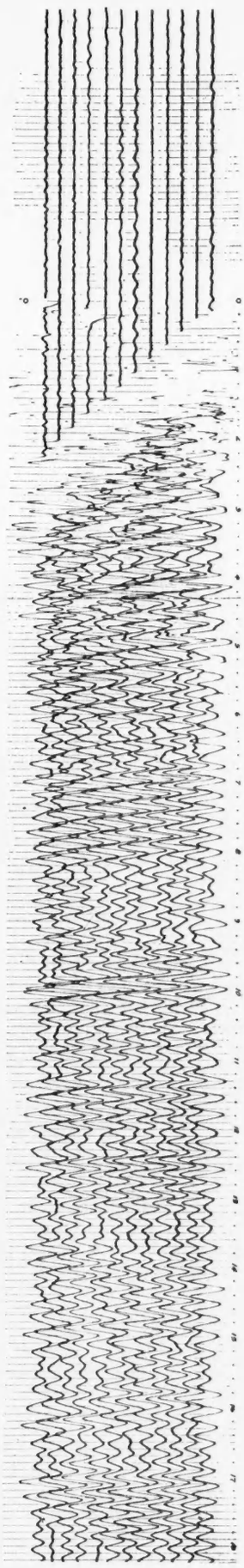


and need for penetrations in excess of its present ability. This unqualified statement is made after studying the opinions of numerous leading prospecting scientists, received as a result of requests made by THE OIL WEEKLY's editorial staff, and whose collective thoughts are expressed in this article. These same sources also revealed that new developments indicate that shallow prospecting is to be more efficient in the future and that there are large areas in the United States still not prospected closely.

In many areas one of the principal limitations of the seismograph method is that the best reflections come from depths too great to be reached with the drill, economically or technically. Also many gravity and magnetic anomalies clearly come from excessive depths. Additional work with other geophysical methods must therefore be done to make sure that the structure extends upward to drillable depths.

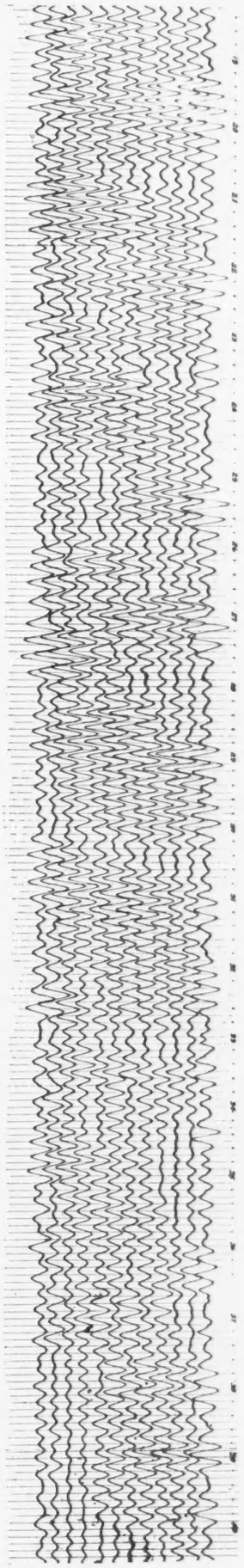
Future Methods

The history of prospecting has been a series of more or less separate and distinct techniques,[1] sometimes overlapping and sometimes separated by a time gap in their period of usefulness, which lose their application and leave the industry without guide until some new method is developed. But innovations always have been forthcoming and the industry has been off on another important discovery cycle. It would be rash to predict boldly what future improvements or changes will take place in the art of prospecting, but apparently they may be confidently expected to come nearer to perfection.

Nevertheless, it becomes worthwhile to try to look into the future

[1] "Our Oil Reserves and the Art of Prospecting," by E. DeGolyer, before the Ninth Midyear Meeting of the American Petroleum Institute at New Orleans, May 15-19, 1939.

Reflection record taken along the Gulf Coast, showing excellent reflections from below 15,000 feet. The heavy, wavy lines at the top are geophone recordings before the shot. The small numerals along the side represent tenths of seconds. Depth of the shot hole was 43 feet and the powder charge 1¼ pounds. The geophone spread was 1200 feet.



to a certain extent to see whether or not there is being developed some advancement in present methods or some entirely new technique that offers promise. It may be that some of the many electrical methods now being tried, or that some form of soil or soil gas analysis, such as have been introduced recently, or even one of the geophysical methods in use today, or some entirely different procedure, such as relying for reconnaissance upon stratigraphic methods and for detail upon structural instruments, will be the solution to the future search for production.

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Economic Problem

Since the seimic, magnetic and gravity methods appear to be further advanced than the drill, and since reflections have been obtained from 40,000 feet, the problem of probable increase or decrease in the search for deeper sources of oil appears to be mainly economic, which involves drilling and producing as well as prospecting work.

With proration allowables reduced to exceedingly low quantities in most parts of the United States, and with relatively low crude oil prices in existence also, some concerns are shunning prospects involving depths exceeding today's levels. Likewise, there are engineers who do not think production will be found at levels much deeper than those of today, and that if any petroleum is located at such great depths it will be in such a highly gaseous and unstable form as to be undesirable.

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The recent recognition of the difference between stratigraphic and structural prospecting methods takes into account the effects, in relatively undisturbed sediments, resulting from an underlying structure. These shallow stratigraphic indications indicate the presence and areal extent, but neither depth nor relief of the underlying structure. That means, then, that these shallow stratigraphic effects are independent of the depth or the relief of the indicated structure, and can then be used to indicate the very low relief structures that have been passed up by the reflection seismograph. Further, these shallow stratigraphic variations, in the opinion of one party, will operate through the whole thickness of the sedimentary column.

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For instance, one individual stated that, broadly speaking, the magnetic content of the rock strata increases with depth, terminating in the highly magnetic crystalline basement rocks. Because it is these deeply buried magnetizable materials which usually account for the principal effects observed at the earth's surface with magnetic instruments, this method discloses the structural configuration of the deep strata with greater facility than the overlying formation, and therefore should find greater usefulness as exploration extends downward in the search for deeper-seated structures. The magnetic method has been utilized in the past to determine the structure of magnetizable zones having depths of approximately 20,000 feet.

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EARTHQUAKES *by John Milne, F.R.S., F.G.S.*

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U·S·A· 1919 A·D·

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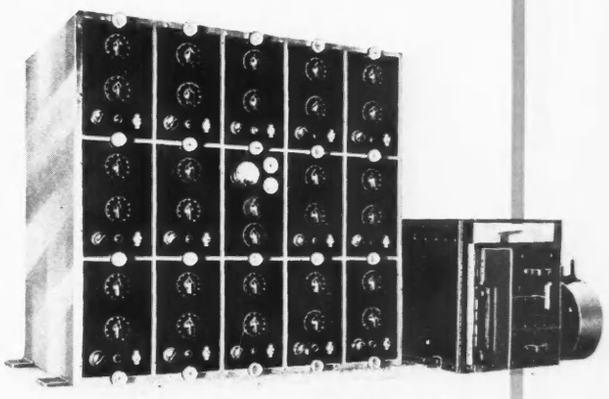
seismic exploration for petroleum structures . . . and has continued through 20 years of operation

Eminently Successful



McCollum's Seismograph Amplifier and Recorder

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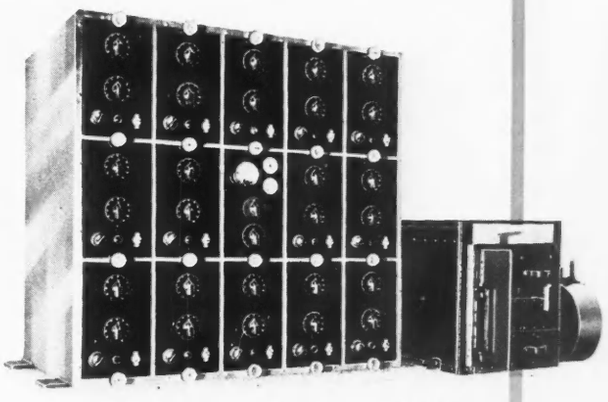

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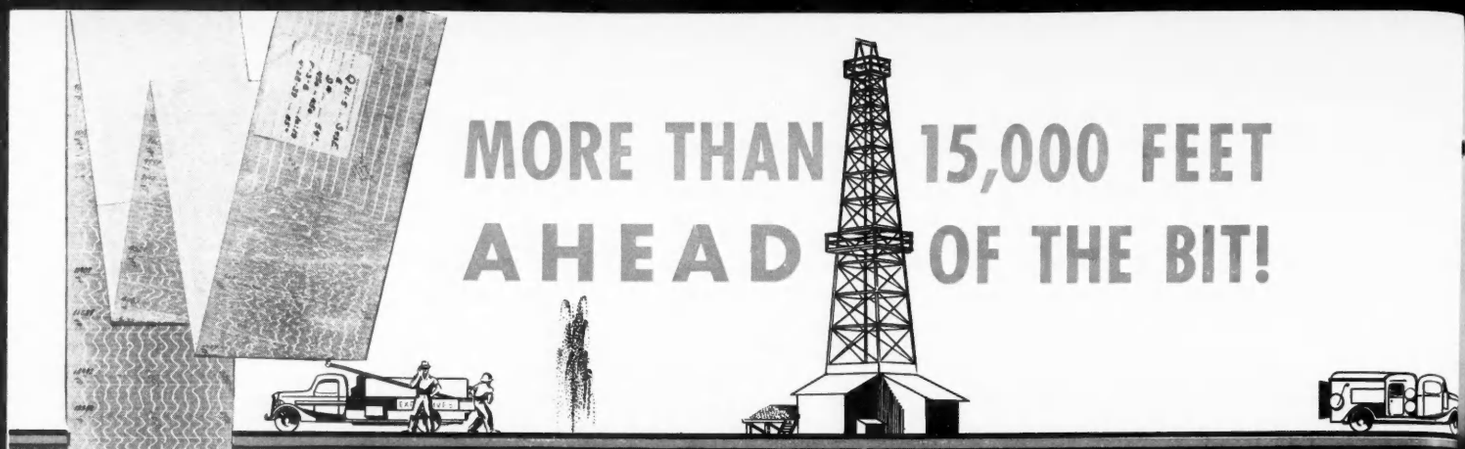
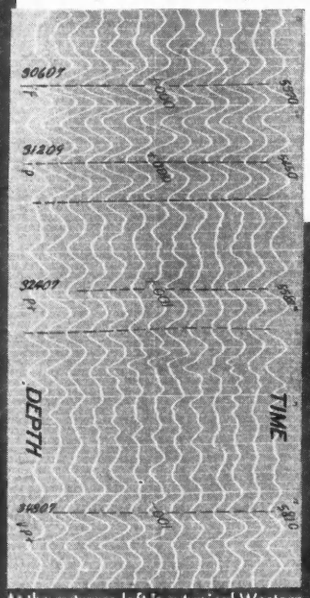


☆ Reflection Seismograph Surveys by Western Geophysical Company are extending thousands of feet deeper than the deepest oil well thus far drilled. Although today new deep well records are being established faster than ever before, it will be years before the bit penetrates the formations now reached in reflection seismograph exploration. ☆ In California, for example, Western Geophysical Company—looking ahead toward future deep well drilling operations—is mapping structure 20,000 to 30,000 feet below the earth's surface. Using the most scientific methods and equipment available, this organization is securing sub-surface information which will be used not only in drilling tomorrow's wells, but to give a more complete sub-surface picture for the guidance of *today's* wells!



At the extreme left is a typical Western Geophysical Company seismograph record secured in a deep sedimentary region of the San Joaquin Valley, California. The enlarged section shows reflections recorded from horizons below 30,000 feet in depth.

☆ Western Geophysical Company maintains trained and experienced field crews for geophysical prospecting either in the United States or abroad. ☆ We will be glad to supply more detailed information on request.

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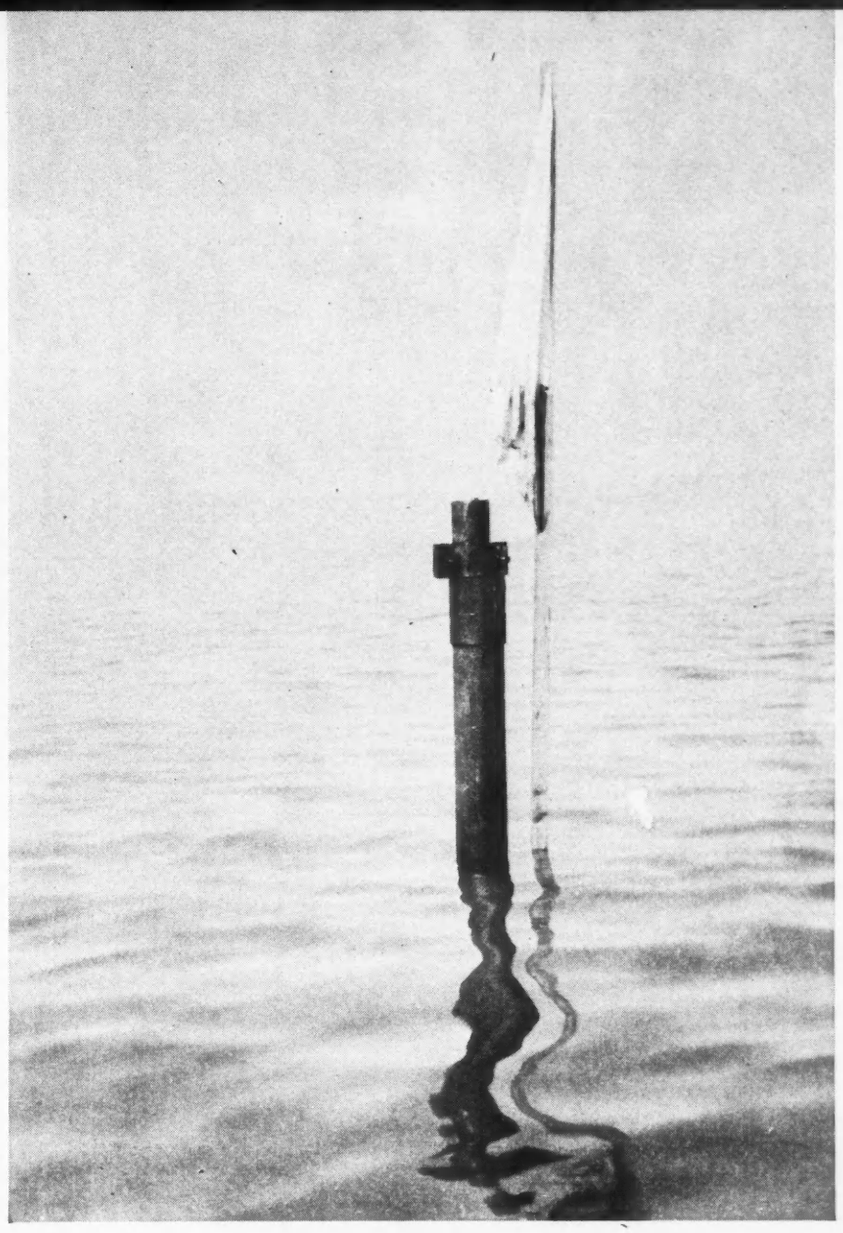
flection seismograph to locate structures is not limited by a depth twice those now being drilled. Consequently, the seismic method will not be abandoned because of its inability to work at lower depths, and its use for deep-seated prospecting should diminish only when all available structures with sufficient relief to be mapped by it have been found.

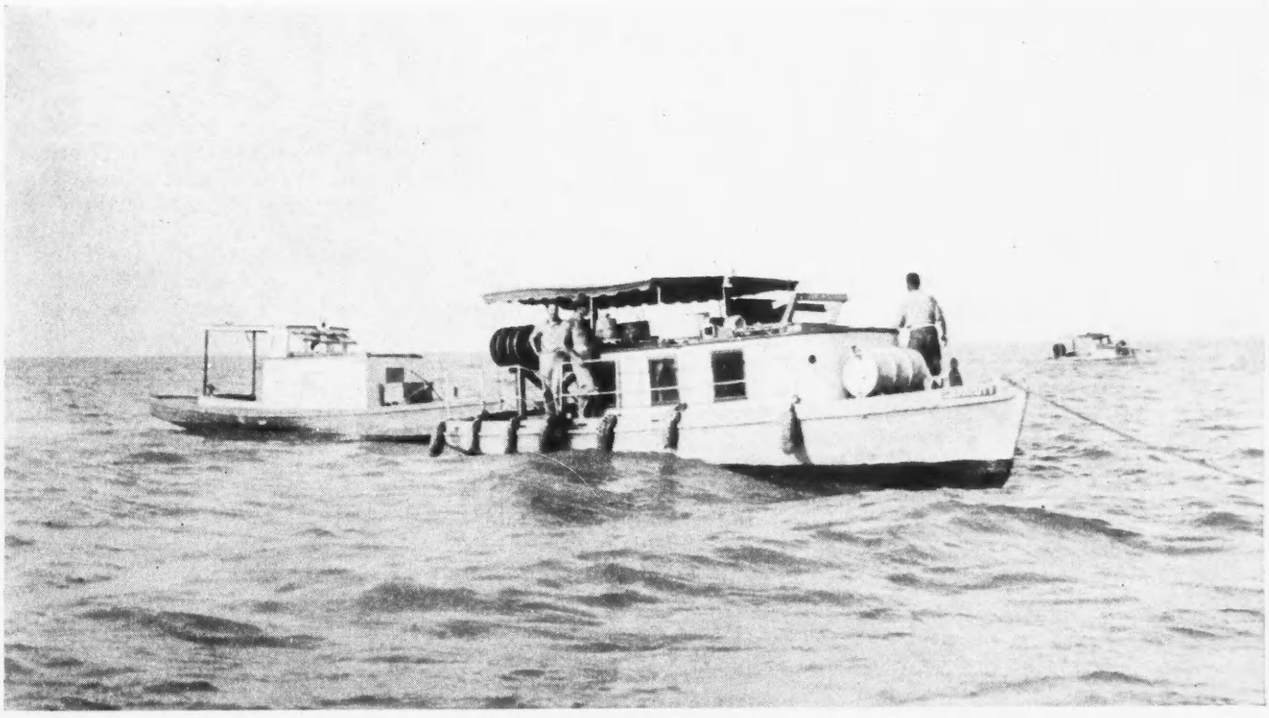
This method already is far advanced. In California, reflections have been obtained consistently in some regions from horizons down to 40,000 feet in depth with dynamite charges of 5 to 15 pounds, and for the past year or so mapping of beds to depths of 20,000 and 25,000 feet has been usual practice in many of the surveys conducted in the southern part of the San Joaquin Valley and in Los Angeles Basin.

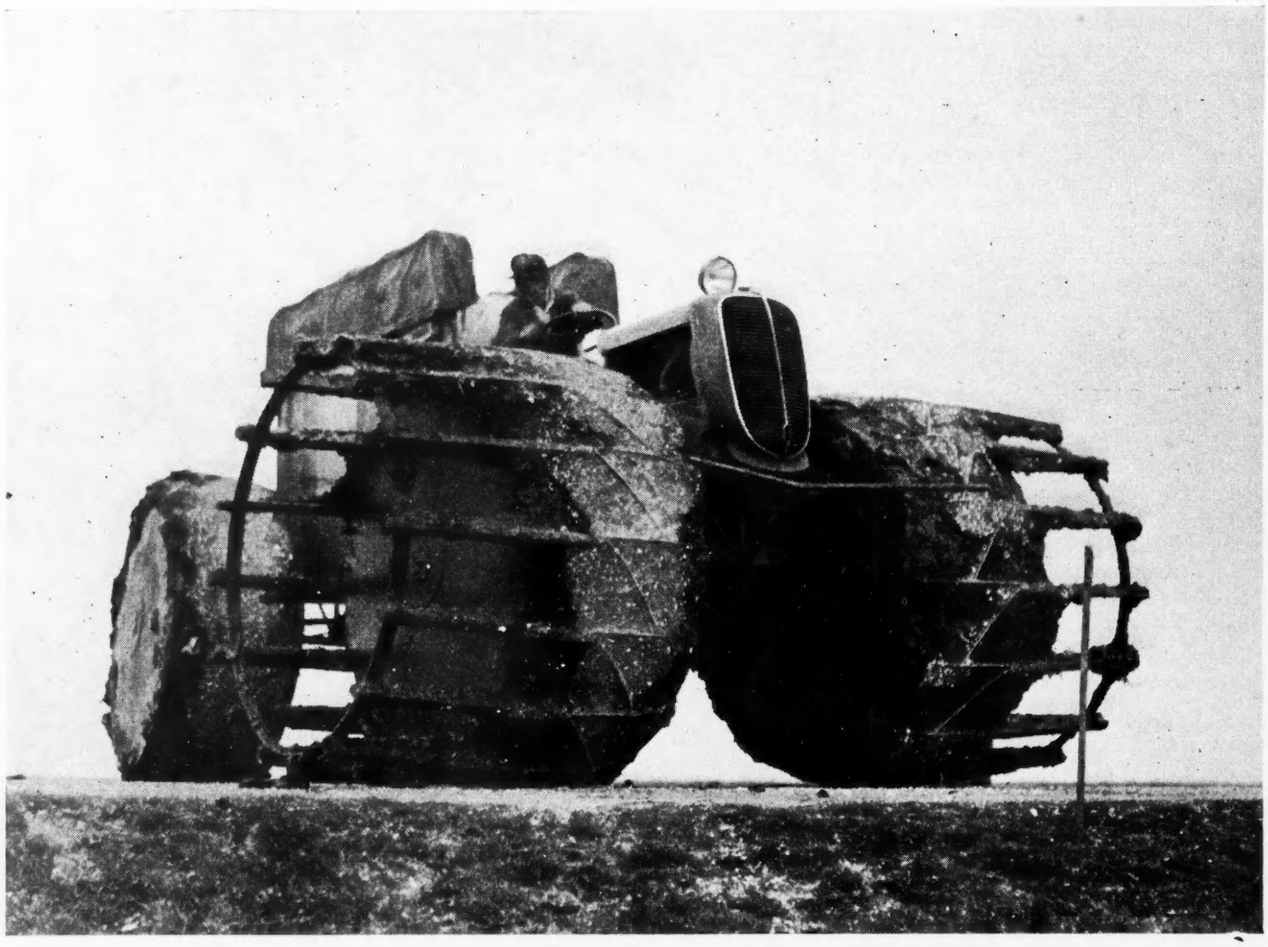
While, generally, the maximum depth range of sufficiently constant



At right—Shot hole and marker in one of the large submerged areas along the Gulf Coast.

Below—Recording and shooting boats used in Galveston Bay during geophysical prospecting work.





A new geophysical type swamp buggy now in use along the Louisiana Gulf Coast. Instruments and supplies are carried, and the vehicle is not stopped by land or water.

reflections in the Gulf Coast area ranges between 10,000 and 12,000 feet, reliable data has been secured for some time from below 15,000 feet. With a special technique the depth can be increased several thousand feet in some areas; however, due to the increased cost of this technique, there has been but small demand for its use up to the present time.

One reason for this attitude on the part of operators appears to be based on their confidence in the general tendency of Gulf Coastal structures to become accentuated with depth. Thus, they assume that a well-defined anticlinal nose with no closure at a depth of, say 10,000 feet, probably overlies an area of structural closure a few thousand feet deeper. On the basis of this assumption they are usually willing to drill without the added expense of a special effort to prove closure at a greater depth. In other words, the prevailing depth limit of present day reflection work in this area is generally determined by economic rather than technical limitations.

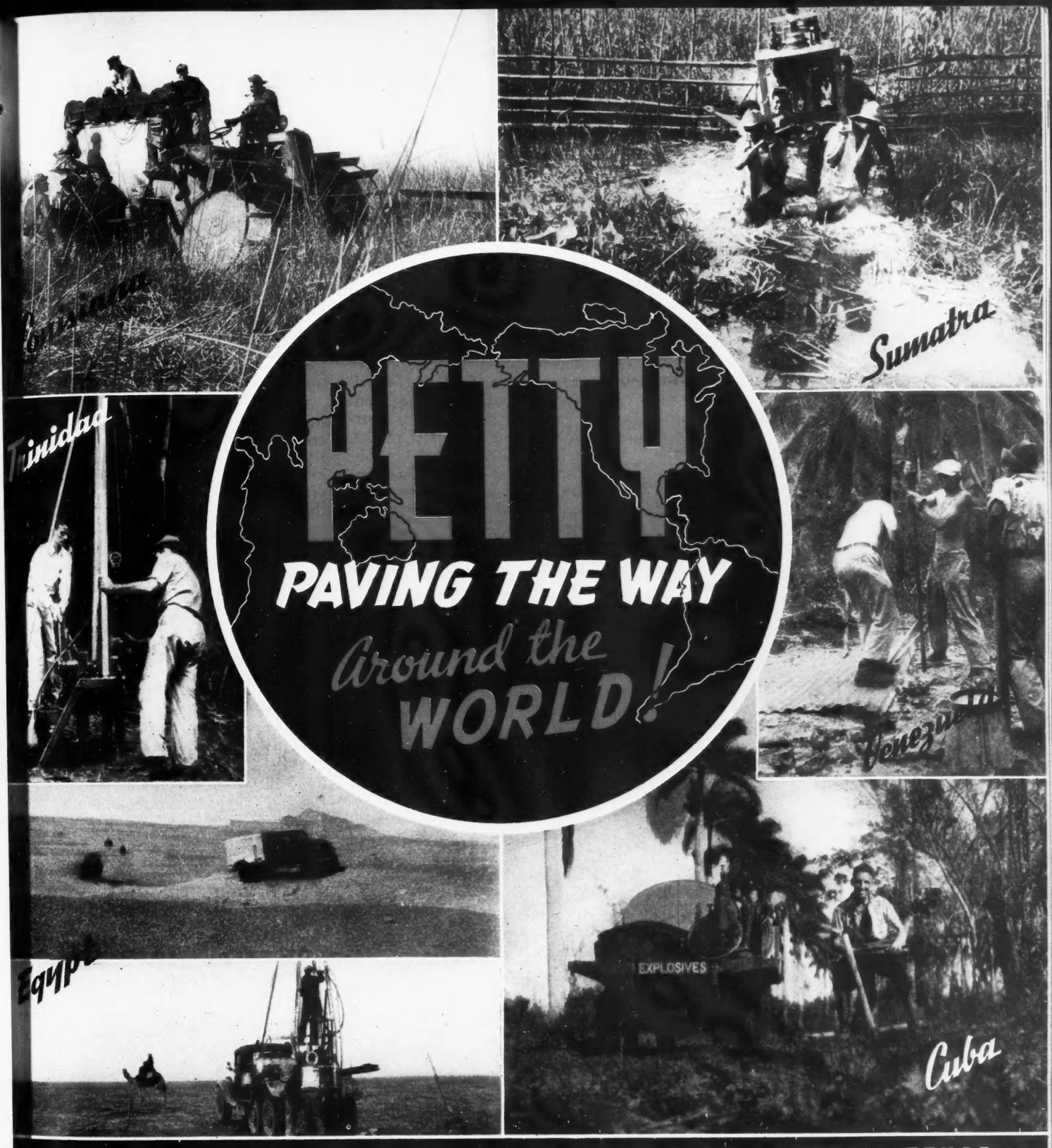
Reflection Problems

The use of the reflection seismograph for deep prospecting, however, is not without its problems. The search for new structures and detailed mapping at depths in excess of 12,000 or 13,000 feet require the most refined instruments and methods of interpretation.

In order to record the deeper reflected waves it is necessary to employ instruments which are 15 to 20 times as sensitive as those which sufficed a few years ago when only the shallower reflections were considered of importance. Of course, the ground unrest is amplified along with the reflections, and consequently increased sensitivity alone is no solution, unless the ratio of ground noise to the amplitude of the reflected wave can be reduced. This is accomplished principally by an increase in the number of seismometers on each camera tree, and by the optimization of the permissible frequency discrimination of the record system. Care in the selection of suitable frequency characteristics for the instruments will be rewarded amply. The frequency components of importance in the reflections from very deep horizons are distinctly different from those in reflections from shallow horizons; consequently, effective reception of these deep reflections requires a different choice of frequency discrimination than that in normal use. Automatic volume control is an important factor, and when properly designed facilitates the production of good seismograms at great depths.

Computation Methods

Methods of computation require refinements for the very deep horizons that would be unthought of in normal work. Not only must all determinations of dip and the location of reflection points be made by three dimensional recording, but also the exact path or curva-



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ture followed by the reflected ray must be determined and utilized in mapping of the subsurface structure. Lateral changes in velocity which may be normally neglected in the mapping of any local area must be taken into account in the computations of the dip and depth figures for the very deep horizons. It is very important to have accurate velocity data, and a well-distributed volume of velocity data is of great assistance. This necessitates a knowledge of velocities obtained from surveys made in several wells in the general region being explored. As the number and precision of velocity surveys increase, the accuracy of the reflection method increases correspondingly, making it possible to map with confidence structures of increasingly smaller closure.

Analyzing Apparatus Designed

The matter of seismograph records appears to be one of future importance. While clear records are obtained at great depths in some regions, there seem to be certain areas where many "wiggles" are recorded, but which have no readily ascertainable significance. Likewise, in some localities clear reflections are obtainable from shallow beds, but the latter parts of the record, corresponding to greater depths, are vague. Although they contain visible wiggles, these do not fall into a clear understandable pattern that can be interpreted. Accordingly, some concerns are devoting their efforts to the development of apparatus with which these dim and confused records can be interpreted. Such an analyzing apparatus has been designed, but, so far, at a cost higher than the industry wishes to pay for the service. Present studies of this nature, however, may perfect less expensive and more versatile analyzing means.

The use of more detailed shooting, including closer spacing of shot points and profile lines, the use of continuous profiling giving 100 percent subsurface coverage, and maintaining the greatest possible accuracy in weathering corrections are important field technique considerations.

U. S. Shortage Not Likely

Since shortly after 1859, when the modern oil business was born with the completion of the first producing well in the world, there have been periodic manifestations of apprehension lest petroleum resources of the United States were soon to be exhausted. Recently, the cry of a probable petroleum shortage in this country has grown louder, as it continues to furnish over 60 percent of the world's production and as the extreme importance of the mineral has been recognized. Some believe that within a very short period there will not be a sufficient quantity of domestically produced petroleum to provide fuel and lubricants for the nation's large number of transportation units, heating furnaces and industrial plants.

Therefore, the question of probable future rates of oil discovery is a subject of wide interest and vast importance, not only to oil operators, but also to the consuming public.

Contrary to gloomy predictions of an early exhaustion of the United States' oil, this nation very likely will be able to supply consumptive demands for a good many years, despite anticipated future growth in the already huge quantity being consumed annually. Recent far-reaching advancements that have been achieved in the art of prospecting, the development of new techniques now in their infancy and research studies now under way are technical operations that presage important future discoveries in the United States at both shallow and deep levels, while the trend of discovery rates provides an additional indication that new sources of supply are yet to be found.

The trend of discoveries of both volumes of oil and number of new fields cannot be disregarded in attempting to determine potentialities that may be projected into the future.

No Sudden Discovery Cessation

It is of extreme importance to realize that there will be no sudden cessation of discovery. When the time approaches that the United States is to shortly experience a shortage of petroleum resources, new supplies will become increasingly harder to find as the number of ultimate fields nears depletion. This factor will provide ample warning, and past records show the nation has not yet reached that stage. In view of this significant factor, the people of this nation should not become too greatly alarmed over an oil scarcity until the trend of finding oil begins to show the approach of an era of smaller volumes of discovery.

Reserves Greater Than Ever

While the prophets of disaster have been tuning their vocal cords for new scares of scarcity, the industry actually has been discovering oil so rapidly that it is suffering from an over-supply rather than a deficiency, and proven unextracted reserves have risen annually to new high levels.

Of the more than 38½ billion barrels of oil that has been discovered since the start of the industry, over 56 percent has been found in the last 14 years, and 20 percent of this volume has been located in the last three years. In other words, over 21½ billion barrels have been found in the last 14 years, which is 500 millon more than the quantity of oil the United States has produced in the nearly 80 years since Drake completed the world's first producing well.

Likewise, the number of new producing areas has been increasing sharply in recent years. There were 264 new producing structures discovered in 1938, whereas there were only 224 in 1937 and 165 in 1936.

It is true that the United States' ultimate oil supply is definitely limited to some unknown quantity, and that it is being exhausted at the rate of over 1,000,000 barrels annually. But on the other hand, the sizeable growths in discovery rates that are in existence indicate that the nation may be expected to yield many as yet unlocated producing structures, especially when the billions of acres with general favorable geological characteristics yet unprospected are considered. Surely, they are indicative that new fields have not yet become too difficult to find in large numbers, and that an immediate scarcity is improbable.

Conclusion

Geophysical prospecting has been the greatest single factor in the recent discovery of deep oil reserves in the United States. Advancements in this science have been rapid and sure despite greater prospecting depths and higher odds against discoveries. Each year has yielded advancements that have eliminated barriers to deep prospecting, and the period forward from 1939 looks as promising as the situation appeared in 1929.

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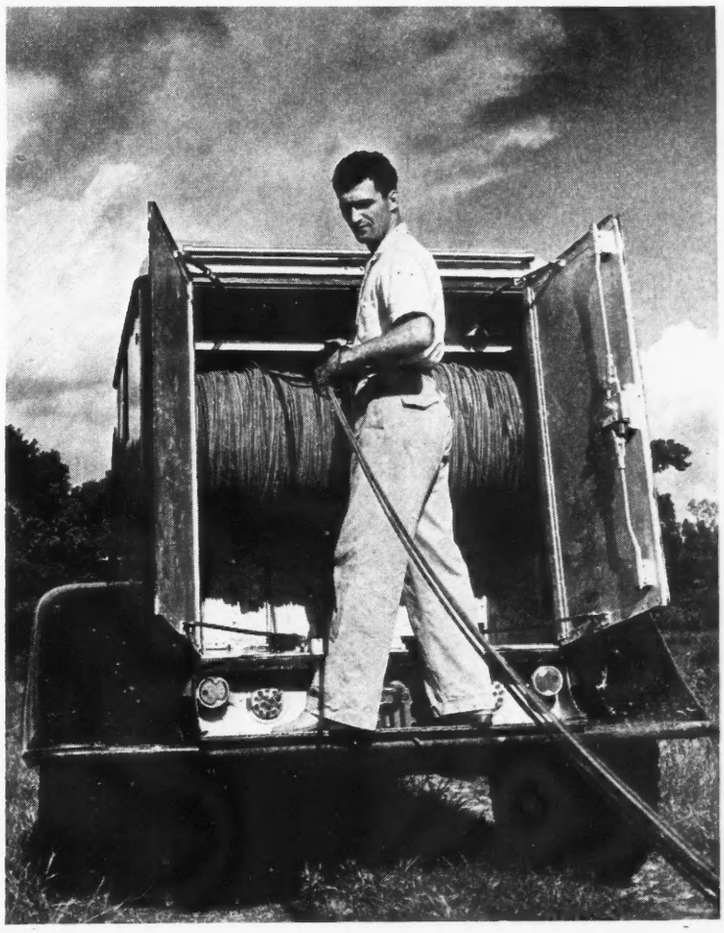

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since which time the United States has experienced its greatest era of discovery.

According to Dr. Frederic H. Lahee[2], 1663 of 2638 wildcat tests drilled in the United States during 1938 were located on technical advice, either geology or geophysics, and 301 of these proved productive of either oil or gas. Of the 579 wildcats drilled without the aid of the prospecting technician, only 44 found production. In other words, 18.09 percent of the holes drilled on technical research were successful, while only 8.22 of those drilled without such information discovered oil. It also will be noted that locations drilled on technical information were twice as numerous as those drilled without it.

While most of the wells drilled on technical information are shown by Dr. Lahee to have been based on geology, the highest percentage of success was in those in which geophysics had been used. Fifteen percent of the wells located on straight geology were successful, while 23 percent geophysical locations proved successful, and 31 percent of those located on combination geology and geophysics found production.

[2] "Wildcat Drilling in 1938," in Bulletin of American Association of Petroleum Geologists, June, 1939, and also in The Oil Weekly, May 29, 1939.

Wildcatting More Effective

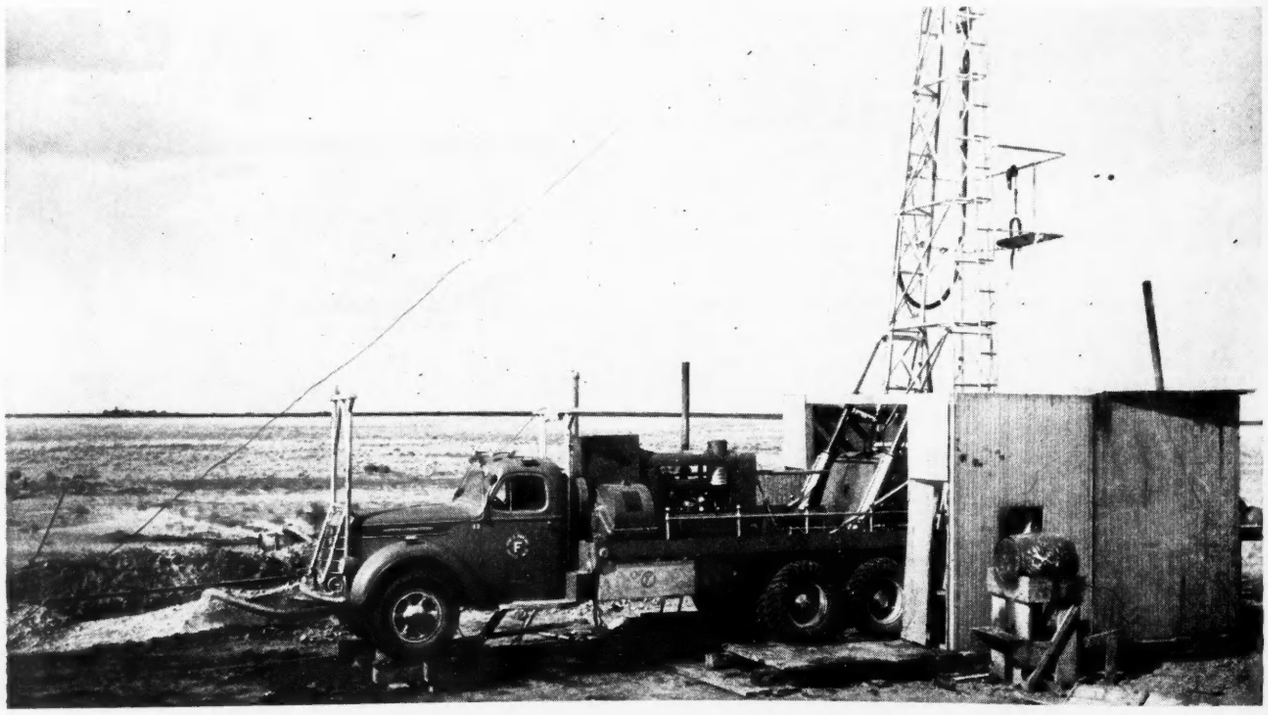
Lahee's study of wildcat drilling shows that during the past four years there has been a steadily increasing percentage of producers drilled, and also a decreasing footage drilled in dry holes for every producer foot. In 1938, 12 out of every 100 wildcats drilled were productive, while in 1935 only 7 1/3 found oil.

Dr. Lahee's statistics on wildcat drilling, in addition to showing a higher percentage of producers, and a decreasing footage drilled in dry holes, reveal steady increase both in the number of wildcats drilled each year and in the average depth per hole.

A wider application of chemistry, electricity and advanced physics has led the geophysicist into new methods that involve geoelectrical and geochemical work that offer promise. But apparently these important developments are more suited to shallower lower-relief type of operations. However, should they prove as excellent as finders of fields as some anticipate, they may change the United States' prospecting search from steadily deeper trends to less deep exploration.

These newer geophysical applications, however, do not remove the established seismic, magnetic and gravity exploration methods from the picture, particularly in searching for deep structures. As a result of rather recent inprovements in instrumental and interpretative techniques these methods appear to offer discovery possibilities in excess of drilling ability. For example, the reflection method at present is capable of delineating structures in many regions up to 20,000 feet and more in depth with considerable accuracy. This can be attested to by California operators, who for the past year or two have been mapping the small and deep-seated structures in the southern part of San Joaquin Valley successfully. Recent advances, together with refinements bound to come in the near future, appear to make the reflection seismograph one of the most important deep geophysical tools for several years to come. The magnetic and gravimetric methods will, of course, have their place and need also.

There is no single panacea for the deep prospecting problem. It is a matter of making use of every new device and development as soon as it has proven its worth and of carefully considering every detail of operation. On this basis alert organizations are learning that they can map deep structures successfully.



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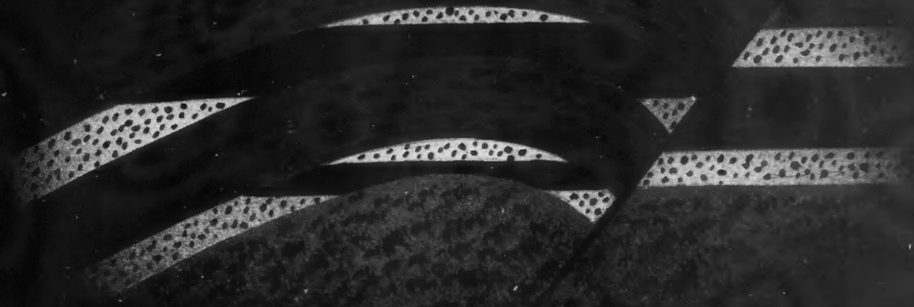


Deep Drilling and Its Relation to the Characteristics of Condensate Production

By E. V. FORAN,

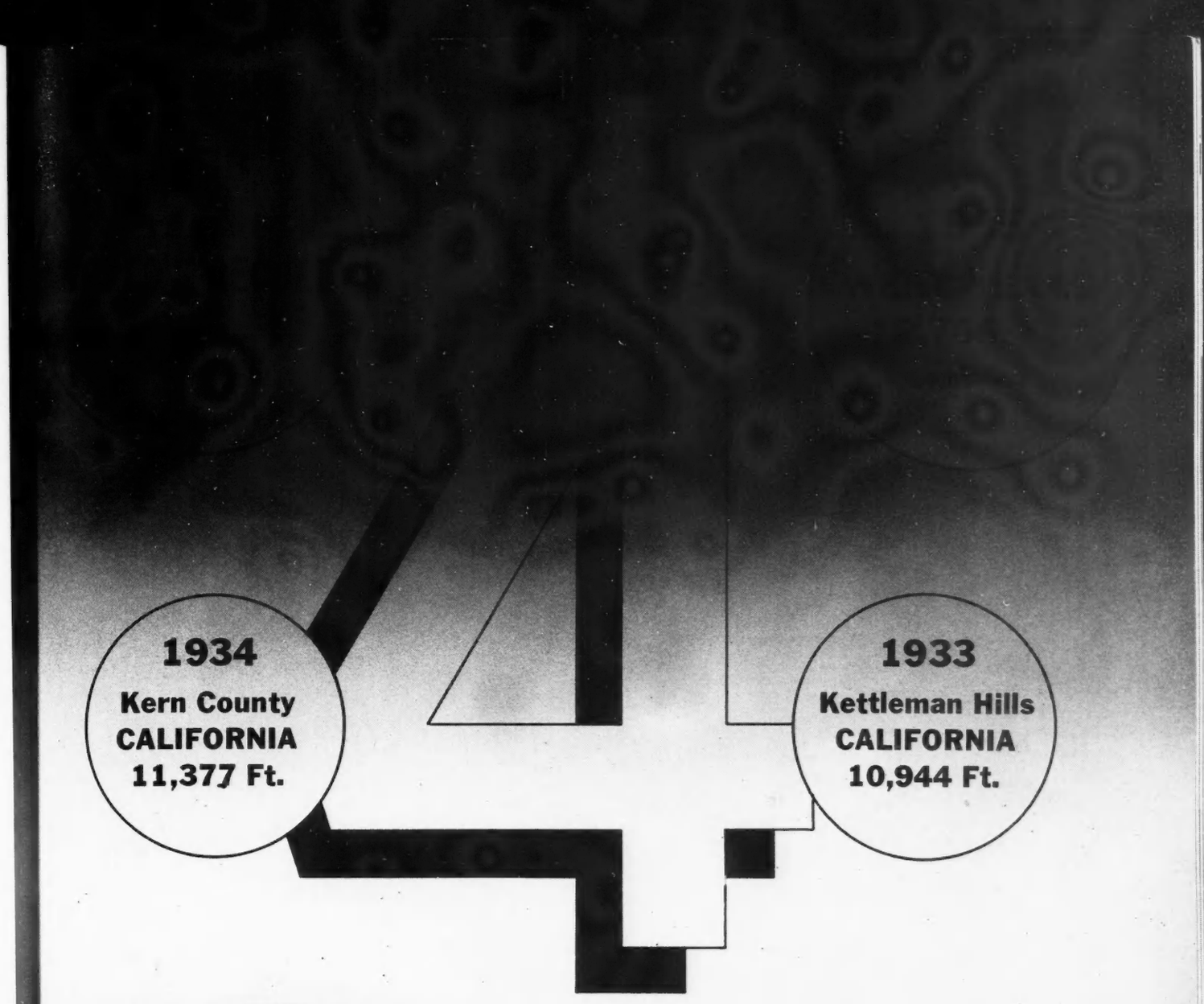
Parker, Foran, Knode & Boatright, Consulting Engineers

FOLLOWING the advent of the first commercial condensate recycling operations less than two years, the industry has observed a progressively increasing interest in the trend of activities whose objective lies in the advancement of practical conservation of gas and gas energy in the development of deeper oil and gas pools. With the trend of future drilling carrying the exploratory and development work to progressively deeper horizons each year, it is becoming obvious to the operators that in the case of condensate gas reservoirs, whether directly associated with crude oil in the same sand or not, that the problem of intelligently producing such reservoirs calls for procedure in most cases peculiar to the particular reservoir under consideration.

While it is true that some phases of condensate operations may lend themselves to standardized methods of production, it is equally true that due to a very wide divergence in character of the recoverable products that special methods of operation will undoubtedly be required to accomplish the most desirable ultimate end. The true characteristics of crude oil produced from reservoirs which contain condensate-bearing gas caps in direct contact with the oil may be said to show little or no difference from that of the crude oil occurring in the shallower pools in the absence of condensate gas. While it is often observed that dark-colored crude oil of A. P. I. gravities ranging from 50° to 60° is produced from condensate-bearing reservoirs, such "crude oil" may be looked upon with suspicion in that its high gravity is due to condensate having been commingled with it after the crude oil was produced from its original place in the reservoir and before its having arrived at the surface. While it is true and possible that even some of the colored components of the condensate may exist in the gas phase in the deepest reservoirs, it is generally in such small proportions to that of the water-white gas phase condensates that the degree of color of a true gas phase condensate should approach water-white closely.

The effect of high temperatures and high pressures upon the phase relations of hydrocarbon mixtures as occurring in deep pools is somewhat beyond the scope of this paper, but in passing it may be stated that there have been observed some rather consistent general trends bearing on this relationship. For example, the higher the temperatures and the higher the pressures existing in the deeper reservoirs in general the higher will be the distillation end point of the products condensed from the reservoir gases. This characteristic is rather strikingly brought out in most cases in which the condensate gas carries a low condensable content such as 0.5 gallons per thousand cubic feet of gas, corresponding to approximately 12 barrels per million cubic feet. In those cases among the deeper pools (7500 feet or deeper) in which the content does not exceed 0.5 to 0.6 gallons per 1000 cubic feet, it is consistently observed that the end points of the condensable liquids are very high and the A. P. I. gravity is low. When the content runs from 1.0 to 2.0 gallons per 1000 cubic feet or higher, the end point is much lower than that of the lean gas and the A. P. I. gravity is correspondingly higher. There is apparently no consistent relationship between the condensable content of condensate gas and the depth from which it is produced.

Condensate is known to be produced from depths below 8000 feet and having a content of only 0.6 gallons per 1000 cubic feet, while, at the same depth in other pools condensate contents of 3.5 gallons per 1000 cubic feet and higher are known to exist. If there were a consistent relationship between a content of a condensate gas and the pressures and temperatures prevailing in the deeper pools, it would be a relatively easy matter to forecast the approximate content of the gas which might be discovered at any given depth. Even in those pools having multiple sands occurring at various depths between 5000 feet and 8000 feet, for example, there is no relationship between depth and content. That is to say that at 5000 feet the content of a gas may be one gallon per 1000 cubic feet, and at 5800 feet 1.6 gallons per 1000 cubic feet; while at 6500 feet the content may be 0.8 of a gallon. Similar cases exist in many pools having multiple sands. A question which is often asked is whether or not at extreme depths a large portion of the ordinary crude oil fractions will occur in the vapor phase as a result of the retrograde phenomena. Laboratory tests conducted to date indicate that it will probably require pressures well above 12,000 or 15,000 pounds before the major portion of an average 36 gravity crude oil, for exam-



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11,377 feet, Kern County, California—from 8,338 feet to bottom all rock bit digging (71 rock bits) was done with Hughes Tricone Rock Bits.

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10,944 feet, Kettleman Hills, California—from 10,200 feet to bottom practically nothing but Hughes Tricone Rock Bits were run.

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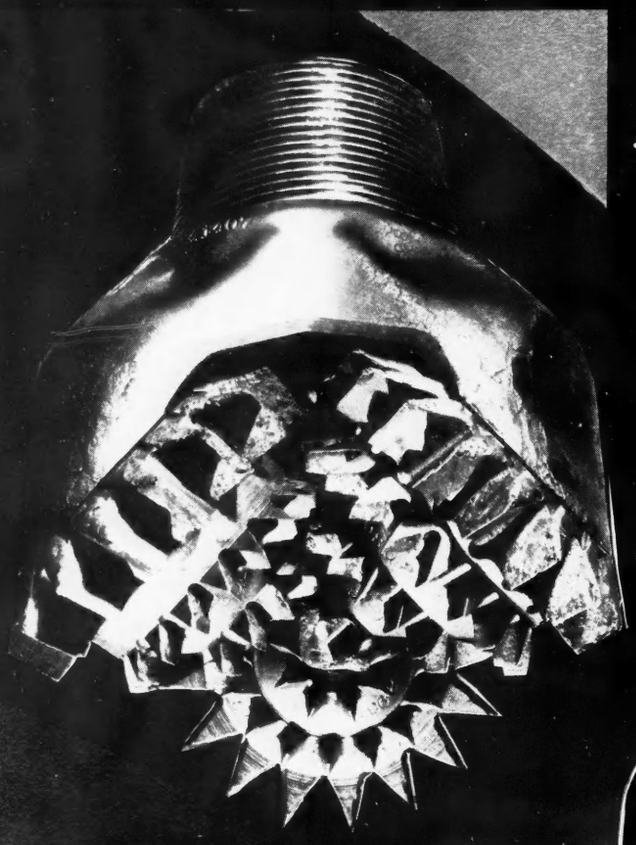

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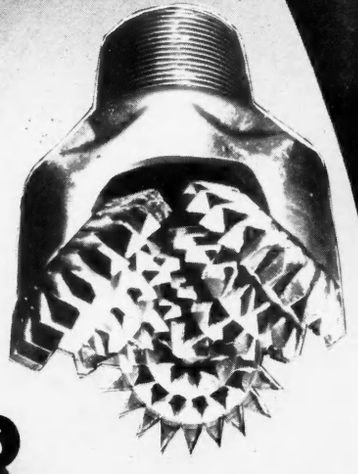

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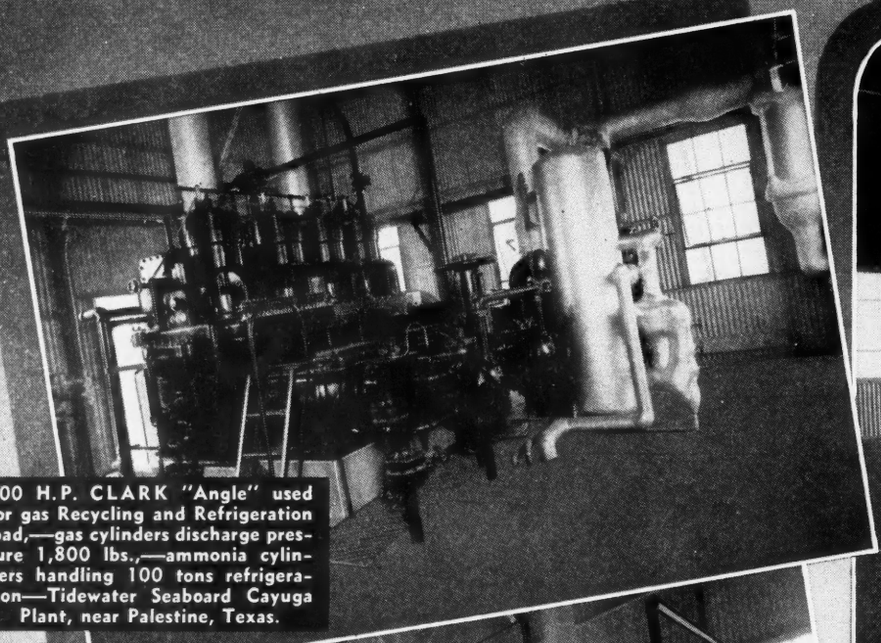
This compressor house at Cayuga, Texas, holds a 400-horsepower engine-compressor with vertical power cylinder and horizontal compressor cylinders. The installation is used in connection with a new type high-pressure refrigeration extraction recycling plant.

ple, will pass into the vapor phase at the reservoir temperatures corresponding to those pressures. Since these pressures normally correspond to depths well in excess of 20,000 feet, it is not likely that in the next few years of drilling anything unusual may be looked for as to the character of crude oil occurring as such in these reservoirs. It will probably be true that under extremely high temperatures and pressures that undoubtedly portions of dark colored oil may occur in vapor phase, but in more or less limited quantities. In other words, at temperatures and pressures corresponding to 20,000 feet or less, the operators may still expect to encounter reservoirs having both the gas and liquid phases present.

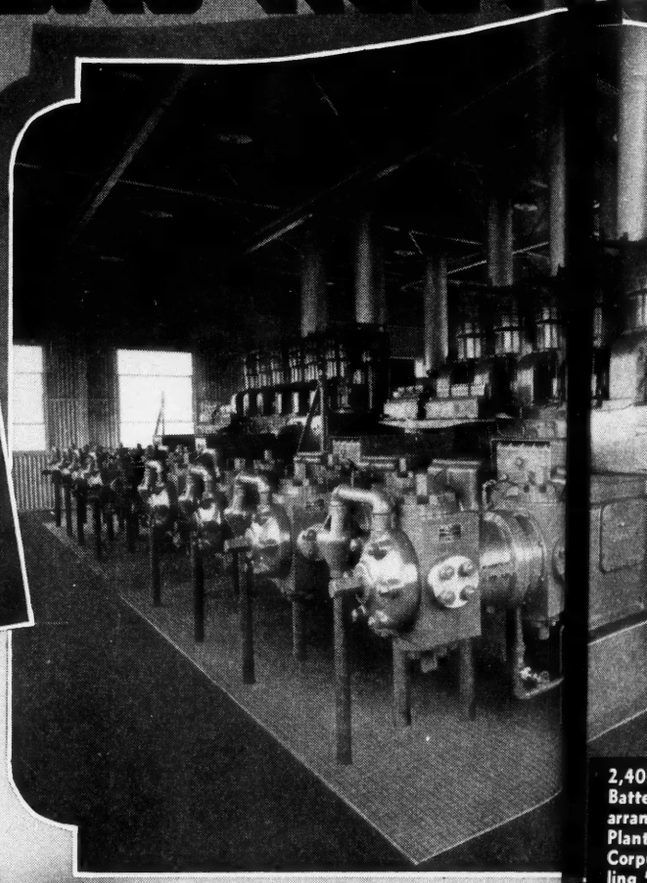
It is still believed by many operators that the average condensate reservoir, while not as valuable as an oil reservoir of like size, is nevertheless capable of supporting a drilling density of the order of 60 to 80 acres per well. When the recoverable reserves of a condensate reservoir are compared to the recoverable reserves of an oil reservoir, each having the same sand thickness, pressure, temperature, etc., it becomes at once apparent that any such spacing as close as 60 to 80 acres per well in the case of the condensate pool development, is a violation of fundamental economics of the problem.

The accompanying Table 1 has been prepared to show the relationship, both economic and physical, of various richness or content of condensate in gallons per 1000 cubic feet occurring in reservoirs at depths of 5,000, 7,000 and 10,000

LEADERS IN GAS RECY



400 H.P. CLARK "Angle" used for gas Recycling and Refrigeration load,—gas cylinders discharge pressure 1,800 lbs.,—ammonia cylinders handling 100 tons refrigeration—Tidewater Seaboard Cayuga Plant, near Palestine, Texas.



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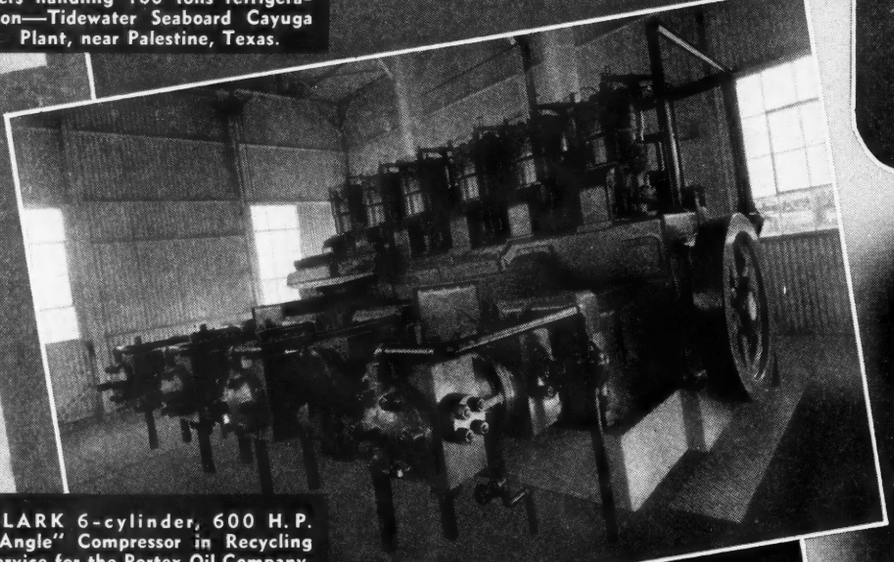

CLARK 6-cylinder, 600 H.P. "Angle" Compressor in Recycling service for the Portex Oil Company, near Joaquin, Shelby County, Texas.

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For gas recycling and repressuri aller fo service in the Midcontinent and G ldings; Coast distillate fields, CLARK "Angl to CL Compressors have been almost l Inject universal choice of operators, to d per "2" Note the "Angle" installations for in low cycling service shown on these pag he sav which are a few of the CLARK "Angl er ope installations that have been made estigate this purpose.

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400 H.P. CLARK "Angle" Compressor designed for 1,700 lbs. discharge pressure,—Continental-Phillips - Shell - Tidewater Unitization Plant, Billings Field, Oklahoma.

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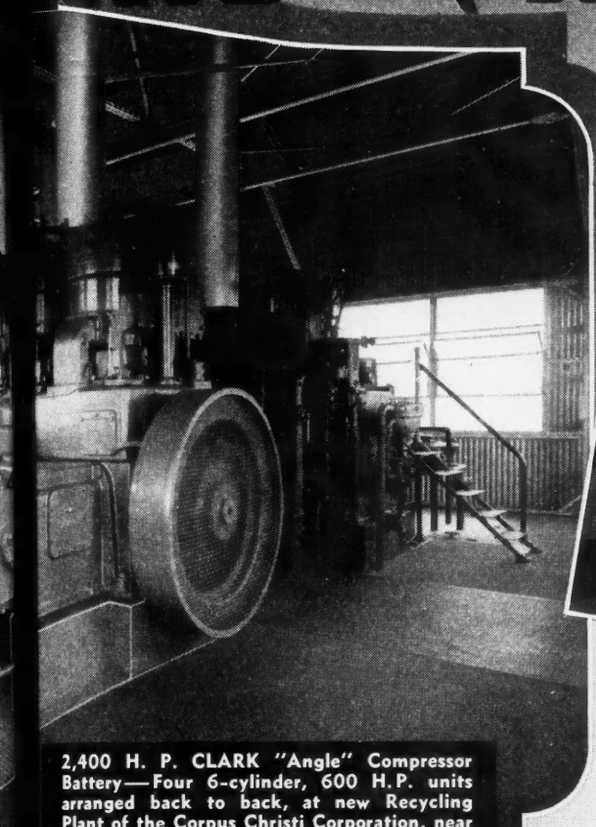

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TABLE 1

Table showing condensate content in place under various conditions and indicated ultimate recoveries.

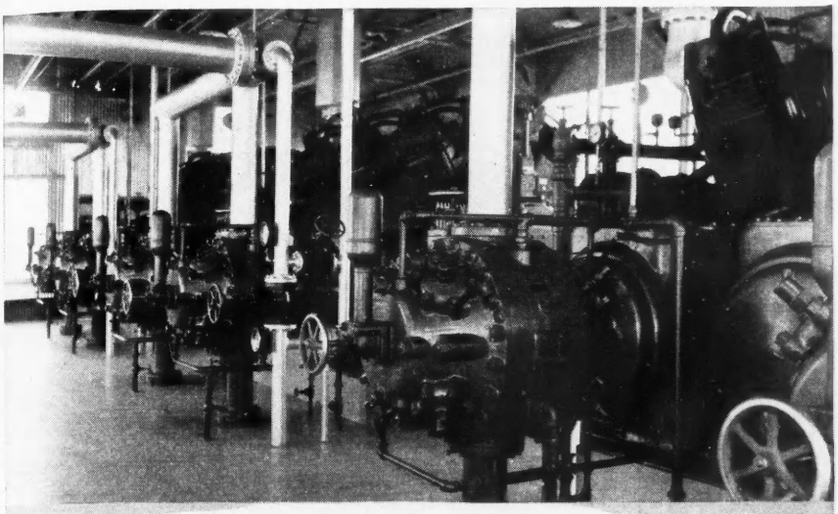
Content Gals. Per 1000 Cu. Ft.	Depth of Sand, Ft.	Normal Reservoir Pressure, Lbs.	Reservoir Temp., °F.	Average Porosity, %	Cu. Ft. Gas Per Acre Foot of Sand	Barrels Condensate Per Acre Foot in Place (Gas Phase)	Barrels Recoverable Condensate Per Acre Foot	Barrels of Recoverable Condensate Per Acre (25″ Sand)	Recommended Maximum Drilling Density (Acres Per Well)
0.50	5,000	2,350	155	25	1,740,000	20.7	16.5	412	300
0.75	5,000	2,350	155	25	1,740,000	31.0	24.8	620	200
1.00	5,000	2,350	155	25	1,740,000	41.4	33.0	824	150
0.50	7,500	3,500	190	25	2,440,000	29.0	23.2	580	310
0.75	7,500	3,500	190	25	2,440,000	43.5	34.8	870	207
1.00	7,500	3,500	190	25	2,440,000	58.0	46.4	1160	155
0.50	10,000	4,700	230	25	2,850,000	35.2	28.2	705	405
0.75	10,000	4,700	230	25	2,850,000	52.8	42.2	1055	268
1.00	10,000	4,700	230	25	2,850,000	70.4	56.4	1410	202

feet. In the table are shown examples of three different contents, one being 0.50 gallons per 1000 cubic feet, representing the leaner type of condensate in 5000-foot reservoirs, and a second and third example of 0.75 and 1.00 gallons per 1000 cubic feet, representing the average content of condensate gas in the 5000-foot pools. The pressures, temperatures, and porosities are average for normal first class sands of this type. Also, the recoverable barrels of condensate per acre-foot of sand carrying the three different contents are shown. In the final column is shown the recommended maximum density of drilling to properly and economically develop such reserves. The content shown for the 7500-foot examples also ranges from 0.50 gallons to 1.00 gallons per 1000 cubic feet, the same as in the case of the 5000-foot reservoir. These examples are well within the range of actual known condensate content in pools of this depth, being of the same content range as those known to occur in the 5000-foot pools.

In the case of the 10,000-foot pools, the content is also shown from 0.50 to 1.00 gallons per 1000 cubic feet. However, the writer does not know of any pools at 10,000 feet carrying contents as low as 0.50 or 0.75 gallons, but for the purpose of comparison showing the effect of higher pressure on greater reserves per acre-foot, etc., these low contents were included. The 1.00 gallon content shown in the case of the 10,000-foot pool is not an unreasonable or an unlikely content to be encountered at these depths since contents as low as 0.70 have already been encountered well below 9000 feet.

The recommended maximum drilling density shown in the last column takes into consideration the inevitable fact that in arriving at such a spacing program there must be taken into consideration the auxiliary expenditures which are inseparably associated with condensate-type well development, such as extraction plant, compression plant, high pressure return field lines, and the associated "input" wells, all of which may be considered as extraordinary investments and expenses when comparing these developments to those of conventional oil pool developments. Due to the fact that the maintained reservoir pressures enable the wells to produce without the customary pressure or potential decline, it becomes entirely feasible to adopt very wide spacing without fear of reduction in ultimate recovery of the reserves surrounding each well.

To illustrate the relative reserves in place as between a condensate reservoir and one containing crude oil, the example of the 0.75 gallon per 1000 cubic feet content of condensate gas in the 5000-foot pool is used. It will be seen that the amount of condensate per acre-foot in place (gas phase) is 31.0 barrels; whereas in the same sand, if saturated by crude oil with its accompanying average amount of gas in solution corrected for temperature, pressure, etc., there will exist in place approximately 1270 barrels per acre-foot. This indicates that there is more than 40 times as much crude oil in place per acre-foot, or per acre, as that of the condensate reserve under similar physical conditions. The percentage of condensate recovery from the reservoir, however, may be reasonably expected to be twice that of the oil; i.e., 80 percent in the case of the condensate as against 40 percent in the case of the crude oil and the ratio of recoveries to be 20 to 1 when comparing crude recovery to condensate recovery. This being the case, certainly then an intelligent spacing program should bear something of the same ratio; or that is to say if a 10-acre spacing would be considered as the closest oil well spacing for 5000 feet, then 200 acres should likewise be considered as the closest condensate well spacing from the same reservoir. The same order of reasoning may be said to apply when comparing any of the other examples shown in Table 1 with those of crude oil development at like depths. It also clearly is indicated by the fact that the recoverable condensate per acre from the average reservoirs is so low when compared to that of crude oil from the same character of sand that any threat that condensate production, either present or future, may have on the marketing of refined products from crude oil is imaginary rather than real. To express this latter statement in the form of an example, it may readily be seen that a daily condensate gas production of 5,000,000,000 cubic feet and carrying a recoverable content of 1 gallon per 1000 cubic feet would only produce 125,000 barrels of condensate daily, which is equivalent to the gasoline produced from a refinery run of approximately 250,000 barrels daily of average 40-gravity crude oil. When it is realized that 5,000,000,000 feet of condensate gas handled daily represents the equivalent output of 100 plants of 50,000,000 capacity each, it may readily be seen that in terms of the crude oil industry that the present condensate development will offer no threat for some considerable time to come.



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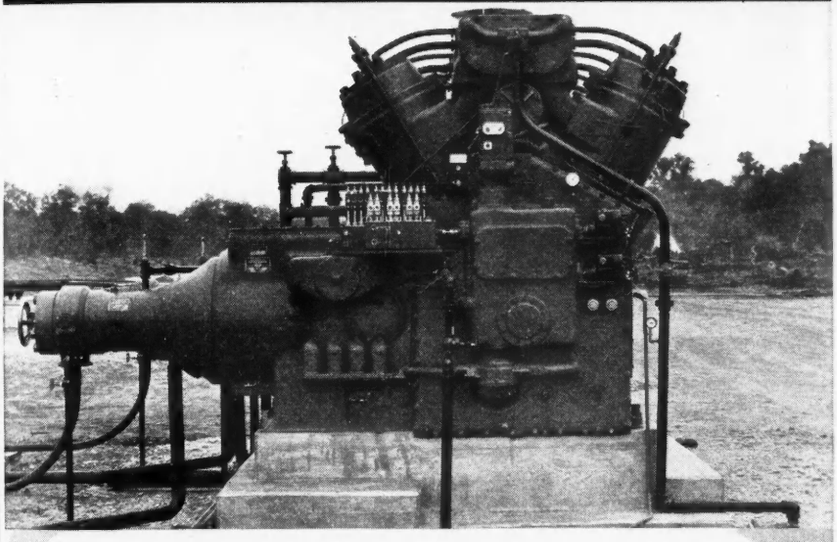

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12,778′ Seaboard Oil Co., Continental Oil Co., KCL No. C-1, Wasco, Kern County, Calif. 4½" and 3½" Hydril Joints.

12,786′ Gulf Oil Corp., McElroy No. 103, McElroy, Upton County, Texas. No Hydril Joints used.

12,985′ Union Oil Co., KCL No. 1-36, Shafter, Kern County, Calif. 5 9/16", 4½" & 3½" Hydril Joints.

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13,000 FEET AND DEEPER

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13,644′ Continental Oil Co., KCL No. A-3-8, Wasco, Kern County, Calif. 5 9/16" and 3½" Hydril Joints.

13,538′ Standard Oil Co. of Calif., Elrich Community No. 1, Greeley, Kern County, Calif., 4½" Hydril Joints.

13,409′ Fohs Oil Co., Buckley Bourg No. 1, West Dulca, Terrebonne Parish, La. 4½" and 3½" Hydril Joints.

13,333′ Fohs Oil Co., State Bay Baptiste No. 1, Houma, Terrebonne Parish, La. 4½" and 3½" Hydril Joints.

13,210′ Amerada Petroleum Corp., and Stanolind Oil & Gas Co., Calcasieu National Bank No. 3-B, Jefferson Parish, La. 4½" Hydril Joints.

13,183′ Continental Oil Co., Proctor No. 1, Washita County, Okla. Combination string, 3½" Hydril Joints and A.P.I. Full Hole Tool Joints.

13,135′ Standard Oil Co. of Calif., KCL No. 8-B-2, Wasco, Kern County, Calif. 4½" and 3½" Hydril Joints.

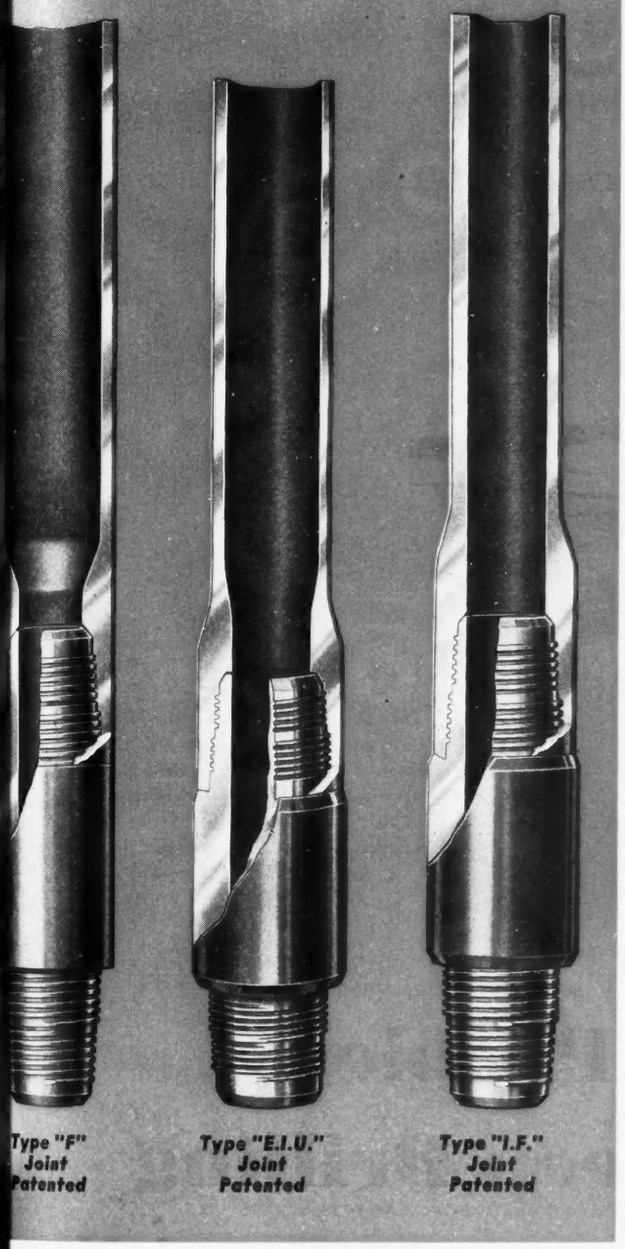
13,124′ Standard Oil Co. of Calif., Mush Rush No. 2, Wasco, Kern County, Calif. 4½" and 3½" Hydril Joints.

Lists compiled from data supplied by Oil Weekly, and checked to July 17, 1939.

HYDRIL JOINTS CAN'T CREEP, WON'T LEAK, HANDL FASTEST, LAST LONGEST OF ALL DRILL PIPE JOINTS

HYDRIL

ARE DRILLED WITH PIPE EQUIPPED WITH HYDRIL DRILL PIPE JOINTS



Type "F" Joint Patented

Type "E.I.U." Joint Patented

Type "I.F." Joint Patented

Of the thirteen wells which have been carried to 13,000 feet or deeper, TWELVE, including the 15,004-foot world's record well at Wasco, were drilled with pipe equipped with Hydril Joints. TWENTY-SEVEN of the thirty-three wells in the United States that have passed the 12,000-foot mark were drilled with Hydril Joint-equipped drill strings.

Hydril Joints are used in the world's deepest wells because they have the greater strength required for high rotation speeds and long strings; bcause they provide twice the number of working threads to absorb wear, and are easily and quickly handled; and because the oversize tool joint that protects the pipe upset can be removed for reconditioning and a new one inserted in its stead without lost time or expensive hauling.

For complete descriptions and specifications refer to pages 1091 to 1134 of your 1939 Composite Catalog, or write to

HYDRIL COMPANY

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Where Hydril Equipment is Manufactured:

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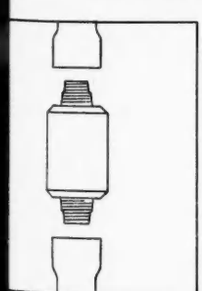
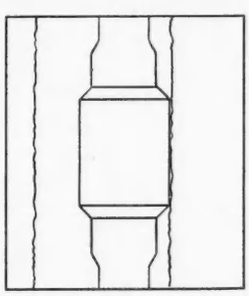
The HYDRIL WAY is the ECONOMICAL WAY

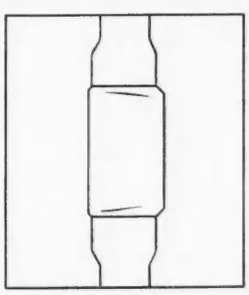
OW HYDRIL OVERSIZE TOOL JOINTS SAVE YOUR DRILL PIPE



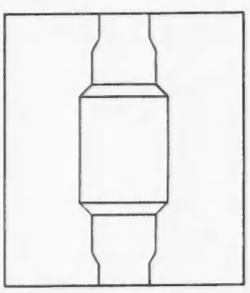
ydril Joint consists of a le-pin tool joint which ws into threads cut di- y into the upset of the pipe. All threads are ing threads.



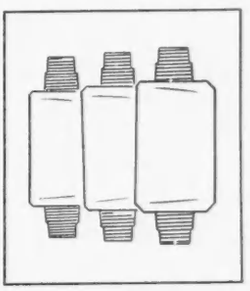
The oversize tool joint provides a bearing against the wall of the hole and absorbs the wear. The drill pipe upset is thus protected from abrasion and its service life is greatly prolonged.



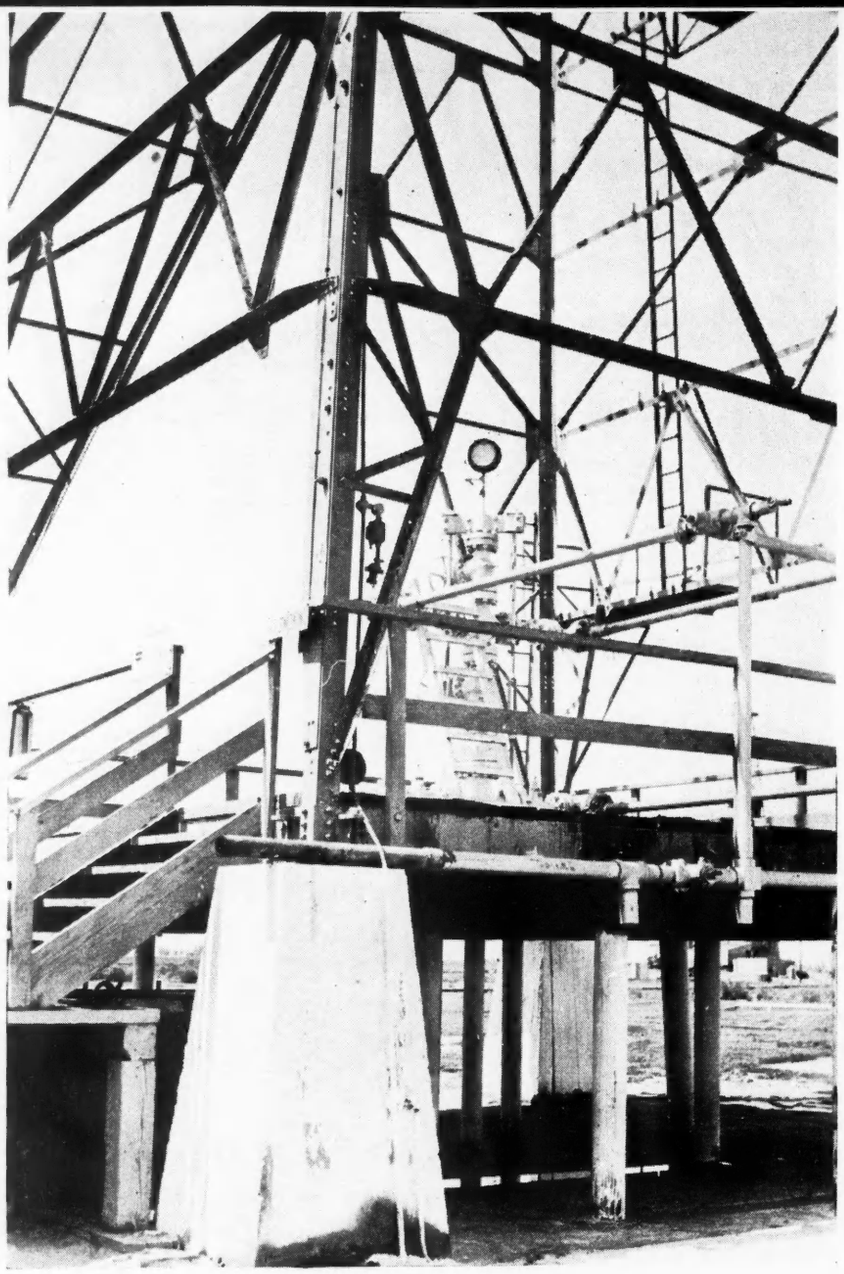
The string is inspected regularly. When the tool joint becomes worn to a point where the upset will soon be exposed, it is easily removed in the field and a new or previously reconditioned oversize joint installed.



Hydril oversize tool joints can be reconditioned at very small cost by any one of several thoroughly practical methods. For purposes of illustration, the diameter of the oversize joint has been exaggerated.



Operators keep a supply of new or reconditioned oversize joints on the rig. The worn joints alone are sent to the shop for reconditioning, thus keeping hauling costs at the minimum.



The discovery well in the Rio Bravo, California, field, Union Oil Company's Kernco 1-34, was for a time the deepest producer in the world. Producing depths in this major field vary from 11,200 to 11,500 feet, and 31 wells have been completed successfully.

New Cementing Problems Created by Deep Drilling Being Overcome Rapidly

By BRAD MILLS, Associate Editor

NUMEROUS complications arise in cementing at deep levels, but these additional difficulties have been met so successfully that 10,000 and 11,000-foot operations are quite common today and successful jobs have been performed down to 14,000 feet.

Placing cement where it belongs in 10,000- to 14,000-foot wells calls for equipment and technique that must meet definite and often troublesome conditions. Every detail in a cementing operation becomes greater with depth. Oil well cementing technique contains a long list of details, the neglect of any one of which may mean the loss of huge investments. The deeper the well the larger the investment, and therefore the greatest possible care should be exercised in planning and preparing for deep cementing jobs.

Studies of cementing failures and analysis of cement under conditions approximating those in the hole

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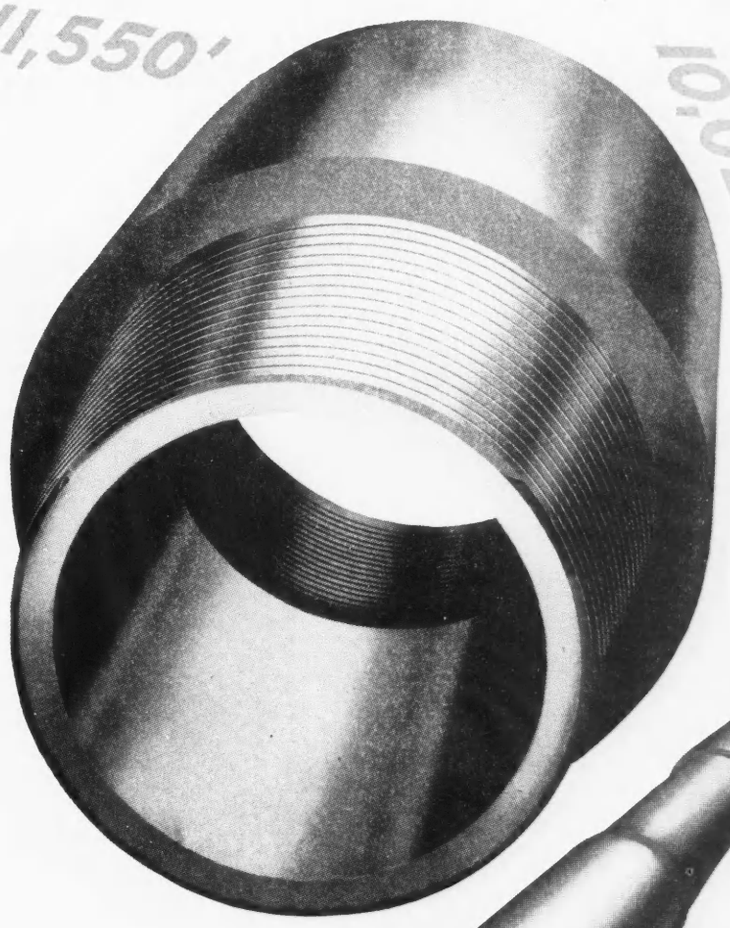

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have done much to reduce the casualties among completion operations during the past three years, and are largely responsible for the development of technique that permits the present-day deep jobs to be accomplished successfully.

The trend toward deeper oil-production levels has necessitated the placing and setting of cement at temperatures and pressures considerably higher than encountered previously, as well as requiring a greater distance of travel to pump the slurry behind the casing. Special retarded or slow-setting, high-temperature cements have been developed to allow sufficient time for the proper placing of slurries in deep wells, while development of high-pressure, large-volume pumps has reduced the time element and overcome the increase in well pressures. Meanwhile, subsurface equipment has advanced materially, and includes several new innovations that are proving of particular importance in accurately placing cement where it will do the most good in deep wells.

Collectively, these many advancements are permitting the industry to overcome rapidly the additional difficulties found at greater depths.

Higher Temperatures and Pressures

Bottom-hole pressures up to 5700 pounds have been encountered during cementing operations, and bottom-hole temperatures up to 335° F. have been recorded.

The increase in bottom-hole temperatures as wells were drilled deeper made it imperative that improved cements be developed, since ordinary cements under such conditions would attain their initial sets with extreme rapidity and before the slurry could be pumped behind the casing. Cements giving satisfactory service at 5000 feet and at temperatures around 150° F. may fail at depths below 10,000 feet where temperatures above 230° are not uncommon.

A primary essential in cementing oil wells is to reduce the water content as low as is consistent with pump pressures. Cement requires from 24 to 26 percent water by weight to bring about the full chemical and physical reactions, but enough extra water should be added to make it easily pumpable. As little as 32 percent has been used successfully. The viscosity of the cement should be maintained far above any other element in the hole. This is to avoid, as far as possible, the mixing of the cement slurry with these contaminating and diluting elements, which when pumping cement three miles affords an opportunity for extremely undesirable contamination to occur if precaution is not practiced.

Cementing should be done on the basis that the job will be completed before stiffening begins, which means as fast as possible. More cementing failures are "buried" or hidden than are obvious. The operator occasionally seems to get the cement in place, yet a satisfactory shutoff is not procured. Determination of causes for such failures are difficult, but much of the trouble is believed to be caused by stiffening of the cement before it is in place, which as previously mentioned is more likely to take place in deep wells because of higher temperatures and greater pumping distances. The average time for mixing and pumping the slurry for deep wells is more than an hour, but difficulties may arise that force a considerable delay.

Although higher bottom-hole temperatures are found in some districts than in others, the average increase in temperature for the United States is about 1° F. for each 50 feet of hole. The scale, however, even in one locality, may not remain constant, particularly where sharp formation changes exist. Temperatures above 300° F. have been encountered at 10,000 feet in Southern Louisiana and Rocky Mountain wells, although the average for that depth in the United States is nearer 250° F. The annual mean temperature just beneath the surface of the earth ranges from 48° F. to 69° F. for the various important oil-producing regions.

A method has been developed for the study of thermal effects on the setting of cement under conditions similar to those encountered in oil-well cementing[1]. A 40-percent slurry of a standard brand of portland cement was used in the investigation. High formation temperatures were found to lead to a rapid setting time for ordinary portland cement. This increased rate of setting is due to the high formation temperature to which the cement is subjected, and also to the resulting higher temperature due to the rapid heat evolution during setting, it was shown. The latter effect contributes quite an appreciable quantity of heat at elevated formation temperatures.

The heat of hydration of a 40-percent slurry has been measured up to temperatures of 150° F. As evidenced by the heat of hydration and the initial setting time, it seems that definite compound formation takes place up to the time of the initial set of the cement. No great temperature effect was noticed during the final set of the cement.

The result of this investigation by Jessen and Webber may well account for the temperature differences found between cement and formations after 12 to 36 hours. Results of this study show that at formation temperatures above 120° F. the rapid setting and accompanying heat evolution of the cement make it probable that the cement slurry begins to set well before it pumped into the desired position. Such a condition would undoubtedly account for many faulty cement jobs.

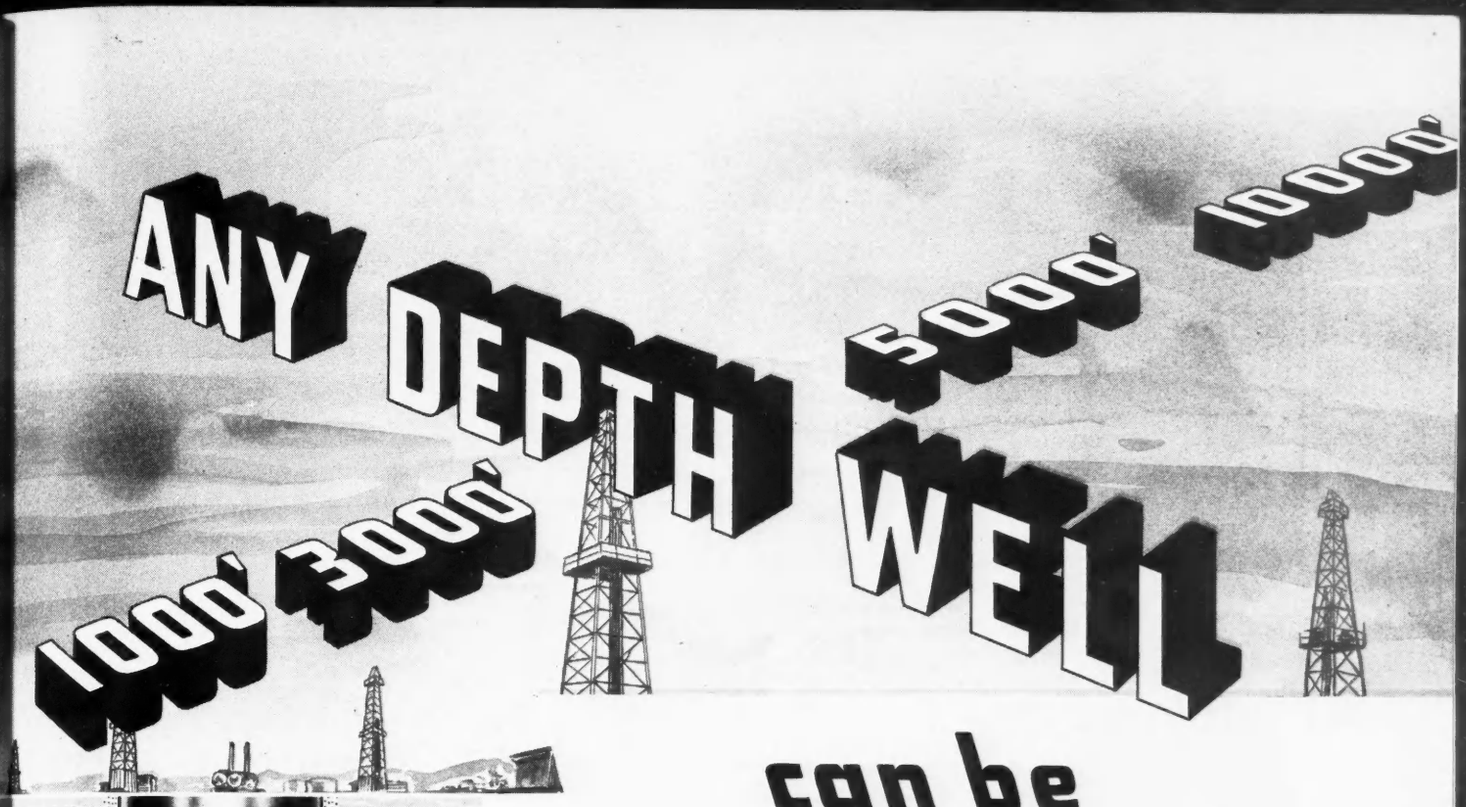
The development of higher-pressured cement pumps has been instrumental in forcing the cement in place despite high pressures and also has assisted in reducing the time required. New vertical-type motor-driven cementing pumps are in use that pump relatively large volumes of fluid at pressures up to more than 6000 pounds per square inch. These pumps, despite their capacities, are light in weight, which makes them suitable for portable units. Experiments are being conducted on steam-driven pumps, and the first of some new high-pressure units are receiving tests in the field at this time.

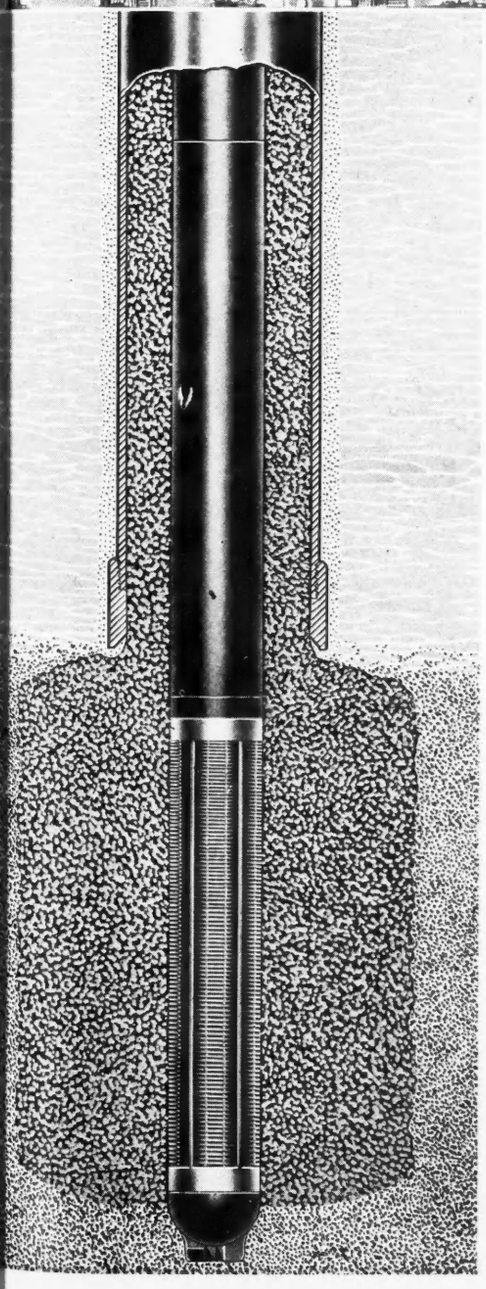
New Processes Developed

There have been numerous innovations in subsurface cementing units, and these have played important roles in the advancement of this scientific art. These new developments in this type of equipment, generally speaking, have been aimed at improving the proper placing of cement at selected levels, at preventing channeling and at thoroughly distributing the cement around the pipe.

Squeeze cementing is a process developed in the last few years for the purpose of shutting off water and for eliminating excessive gas-oil ratios that are too close to the productive zone to permit sealing them off by conventional cementing methods. The method is building up an imposing record of satisfactory results. Squeeze cementing

[1] F. W. Jessen and C. E. Webber, "Setting of Portland Cement," Industrial and Engineering Chemistry, Vol. 31, No. 6.





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Depth is no factor in successful gravel packing. The flexibility of the Layne Method permits deep wells to be gravel packed with the same efficiency and money-saving results as obtained in shallow wells.

This hydraulic method of placing gravel at the bottom of the well results in a thick wall of gravel surrounding the strainer. The gravel forms a natural filter, coarse enough for the oil to travel through without disturbing the original formation.

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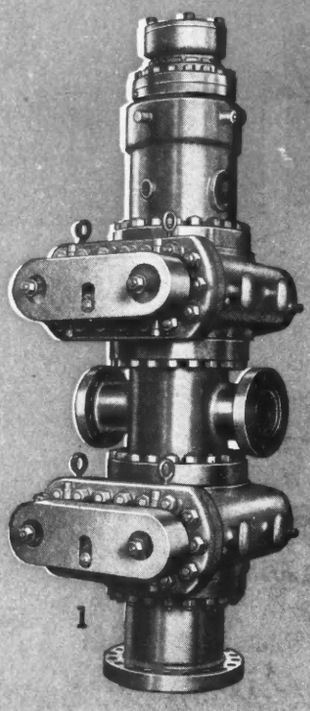


Why not modernize your present SHAFFER Cellar Control Gates to include Self Centering Rams; Larger and Improved Operating Screws; Ball Thrust Bearings to Eliminate Friction when closing under high pressures; and A.P.I. Ring Joint Flanges? *Ask the office nearest you for Details.*

WHEN YOU COMPARE the cost of Shaffer High Pressure Control Equipment with the total cost of a modern deep well, there is no room for argument that "the best protection is a good investment."

From the time of spudding in until after the well is put on production, the Shaffer Equipment pictured here insures positive protection at minimum cost.

1. With the upper Shaffer Cellar Control Gate equipped with rams for sealing off around the drill pipe; with rams in the lower Gate to effect a complete shut-off with the tools and pipe out of the well, and a Shaffer Rotating Blow-Out Preventer and Stripper at top — pressure is no longer a problem.

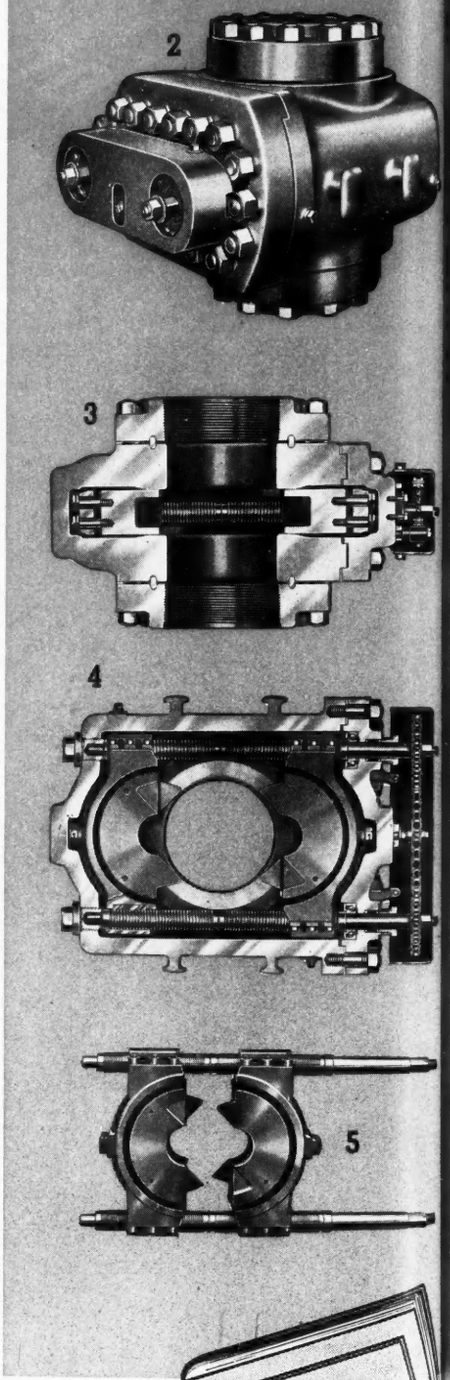
2. The new "10,000 POUND TEST" Shaffer Cellar Control Gate, recently introduced will close and hold indefinitely the highest well pressures yet encountered in modern drilling.

Instant closing and opening of rams is insured through a recently developed power unit known as the Shaffer Gate Closing Steam Engine. This engine requires no changes on present Shaffer Control Hook-Ups—is easily installed—and provides the quickest and surest pressure control yet offered.

3. Made of special alloy steel, accurately machined and equipped with A.P.I. Ring Joint Flanges, Shaffer Cellar Control Gates provide a safety factor far in excess of requirements.

4. Even when internal pressure is extremely high, Shaffer Cellar Control Gates are easily opened and closed, due to ball thrust bearings and to larger diameter operating screws which are clamped to the ram block holders. This rigid construction insures proper alignment and easy operation.

5. The new Shaffer Self Centering Rams have proved to be highly successful for centering small diameter drill pipe in Shaffer Cellar Control Gates having a large bore.



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DEEP WELL INVESTMENT CONTROL EQUIPMENT?

6. With Shaffer Spool Type Landing Heads each individual string of casing is supported on its own flange; suspended on its own set of slips; and packed off against highest pressure, with outlets provided as required.

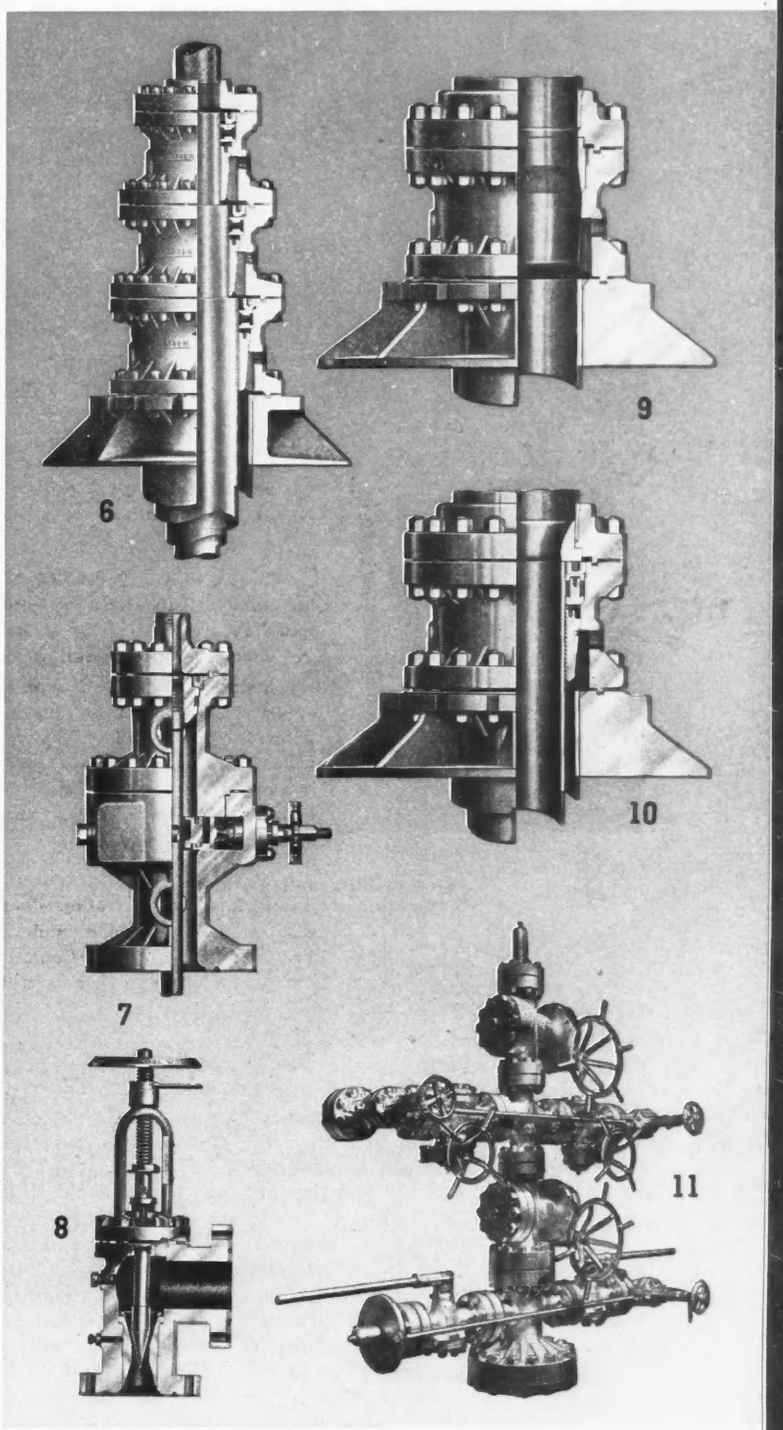
7. The Shaffer Universal Tubing Control Head serves as an efficient blow-out preventer while drilling in and tubing the well. May be installed on producing wells to provide against emergencies that may arise.

8. Shaffer Adjustable Flow Beans are unsurpassed for controlling the volume and at the same time regulating the pressure and rate of flow with extreme accuracy. The Type 34 illustrated is equipped with A.P.I. Ring Joint Flanges and tested to 6,000 pounds per square inch. Made in many other styles.

9. Drilling is readily carried on through Shaffer Full Opening Spool Type Landing Heads, and with two or more Heads installed, neither the size nor length of the drilling connections nor the size of the Gates need be changed. Illustrating the unobstructed opening through a Shaffer Spool Type Landing Head before the casing is landed.

10. Showing casing landed and hook-up ready for carrying on further drilling operations without loss of time.

11. Shaffer Production Hook-Ups and Christmas Trees are made to meet any desired specification; assembled and tested at the factory; and shipped as a unit ready for installation when received at the well. Forged steel construction, lathe-cut threads and A.P.I. Ring Joint Flanges insure control of the highest pressures.



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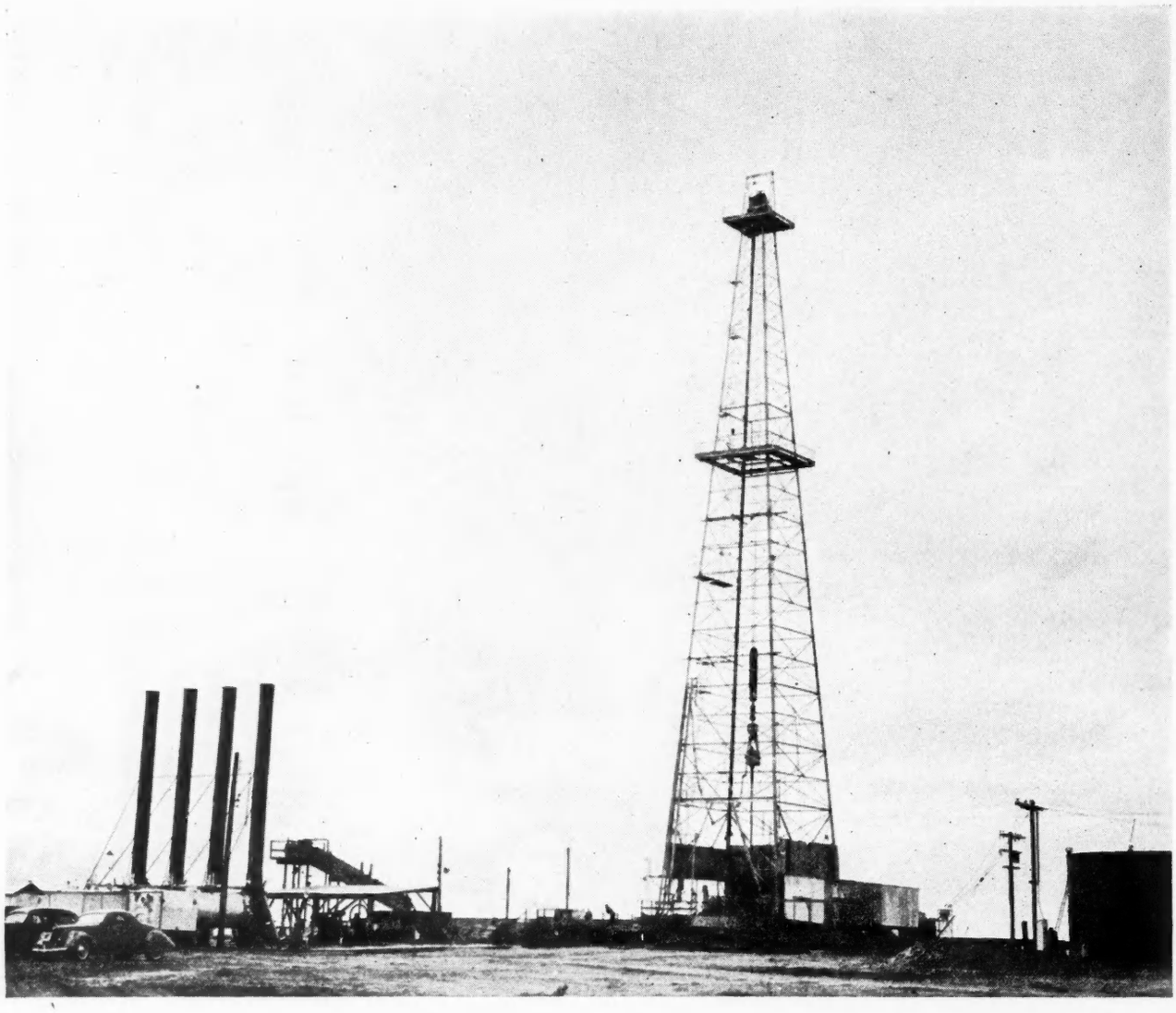

This drilling well in the Wasco field is trying for the 13,200-foot producing zone. No cementing failures have been reported among the few completed wells in this exceptionally deep field.

means the slurry is forced or squeezed by pressure into or against a permeable formation or through perforations made at selected points in casing and liners. Cement slurries are being squeezed against both the oil-bearing and water-bearing portions of a formation without shutting off the oil, but sealing off the water.

Another successful use of squeeze cementing is especially adaptable to wildcat operations testing unknown sources. In many cases it has become the custom to cement behind a string of pipe set through formations that may or may not be commercially productive, and then perforated to test all the likely points. The test holes are shot from the lower horizons up, and when they prove unproductive or water bearing are squeezed off and the next upper level is then perforated and tested in the same fashion. When this is done the producing life of a well may become a series of selective perforating and squeezing, for when one producing horizon is depleted of its oil it may be squeezed off and production obtained in a shallower zone.

The advantages of eliminating channeling and obtaining a uniform distribution of the cement around the casing are understandable readily, and also that these factors become of greater significance and more difficult to obtain with deeper drilling. Therefore, the development of devices in recent years that provide practical and simple means of achieving these ends has been really important. A number of manufacturers have designed equipment for this purpose, and all have contributed to the advancement of cementing.

Multi-stage cementing is another development. It facilitates the placing of large amounts of cement slurry behind long strings of casing, by making it unnecessary to pump all the cement down the entire length of casing and up behind the pipe. By splitting the total amount of cement being used into batches going out at different levels, the time is reduced materially during deep operations. It also makes it possible to spot a stage of cement slurry behind the casing to protect shallower production for future use. By stage cementing one batch of cement may be placed around the bottom casing shoe and other batches may be located at upper levels.

Still another development is full-

IN DEEP DRILLING THE TREND DEFINITELY POINTS TO.....

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12020 FT.

Total of 298 joints of Standard Seamless 7" Extreme Line Casing. Running time of string, 7 hours 15 minutes, averaging 1657 feet per hour.

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10815 FT.

The world's longest string of 6⅝" Extreme Line Casing. Total weight 281,190 pounds. Run to the bottom of a 2-mile hole without a hitch. All-over average time per joint was 2.67 minutes,—shortest running time being 1.5 minutes.

AT

RODESSA, LOUISIANA

9455 FT.

Standard Seamless 7", 28-pound Extreme Line Casing. Run in 7 hours, 6 minutes, including all delays and time out for lunch, averaging 1331 feet per hour, 33 joints per hour, or 1 minute 49 seconds per 40 ft. joint.

AT

WASCO, CALIFORNIA

11572 FT.

A string of Standard Seamless 7", 30-pound Extreme Line Casing required a total of only 10 hours, 5 minutes, including 1 hour 45 minutes for changing blocks. Actual running time, 8 hours 20 minutes!

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hole cementing, in which (1) a full-gauge hole is drilled into the sand, (2) a screen or perforated liner of the same size as the casing is run to bottom, (3) circulation is established down through the entire length of both the blank and perforated sections of the combination string, and (4) the casing is then cemented above the screen or perforated section. The full-hole cementing practices, by permitting the use of larger liners, provides large screen area and drainage surface.

Field Practices

Many cementing failures ordinarily attributed to either the cement or equipment are more logically the result of errors of judgment on the part of oil companies. They could have been prevented in many instances by proper conditioning of the hole and more complete cooperation between individuals in charge of operations. Use of proper cement and cementing equipment is an important consideration, but oil company engineers should provide the service company with all vital information on the condition of the well and also consider this factor in selecting their equipment.

A large producing company experienced continued difficulty in obtaining a water shutoff in a Gulf Coast field. The exact amount of cement that should have filled the hole to the required level outside the casing was used during the cementing operations that proved faulty. When the quantity of cement was exactly doubled the trouble was corrected. Every subsequent cementing job has been a success. It is difficult to calculate the amount of cement necessary to fill the space between the casing and the hole to the desired level, since many caverns and irregularities may exist, and in actual practice the calculated amount may be less than half the required amount. The quantity used should not be less than 1½ times the volume indicated by calculations.

Proper conditioning of the hole is of considerable importance where the casing is to be cemented at great depth. Companies drilling deep wells are doing their utmost to keep the hole straight and have the fluid in the well properly conditioned before starting cementing operations. Many companies like to enlarge the hole for some distance above bottom. The object of this enlargement is to minimize the possibility of channeling as well as to provide a thicker encasement which will insure the pipe is surrounded completely by sufficient cement. The enlargement of the hole diameter also will remove any mud cake on the wall, and give the cement a better chance of bonding with the formation. Tight places in the hole, of course, must be reamed out before running casing.

In running long strings of casing in deep wells, floating equipment is used. Most companies use a whirler float shoe and float collar, but some use a float shoe and two float collars. The location of the top collar when two are used establishes the point where the plugs will bump, and although this is usually only one joint above the shoe, most operators prefer it higher in order to be sure that all tailings or weak cement is left in the pipe and only uncontaminated or undiluted cement goes around the casing.

Operators now are setting casing with a changed relationship to the producing formation. Ten years ago the average casing string was landed on top of the sand, formation pressures and temperatures were low, and an ordinary cement would provide a satisfactory shutoff. Moreover, production usually was taken through unrestricted large diameter casing, so the strain on the cement was negligible, and it served as little more than a casing seat and shutoff from the strata lying above the producing sand.

Conditions have changed, and now casing strings are commonly cemented through or far into the producing zones, and selected completion formations may contain free gas on top that may be desirable to shutoff, oil in the center and water on bottom.

Cementing long strings of casing at depths below 10,000 feet is now being done at Rio Bravo, Wasco, Greeley, Old Ocean and Lafitte with almost routine procedure. Subsurface equipment made up in the casing string, surface equipment, cement, and careful procedure are principal factors involved in these successful cementing operations.

An outstanding cement job was completed recently by Superior Oil Company in its Moodie 1 test at Rio Bravo, in which a string of 7⅝-inch casing was floated in and cemented at 11,528 feet. A 12¼-inch bit drilled the hole below the 1800-foot 13⅜-inch surface pipe to 8789 feet, and an 11-inch bit from there to 11,528 feet. The 7⅝-inch O.D. smooth joint casing was then floated in and cemented. This string was equipped with a regular cement float shoe at 11,528 feet, a cement float collar at 11,485 feet and another float collar at 11,444 feet.

Cementing was done with two trucks, one with 350-pounds and the other with 500 pounds steam end. The bottom-hole temperature was 250° F. The 2500 sacks of cement used for cementing this casing were mixed in 40 minutes. During mixing, flow through the collars and shoe was at the rate of 585 gallons per minute but during displacement of the cement the flow through the collars and shoe was at the rate of 1380 gallons per minute. Two 15½x9¼x22 rig pumps operating on 500 pounds steam pressure were used for displacing the cement around the casing. During the cementing operation the initial pressure was 500 pounds per square inch, and the final pressure was 2200 pounds per square inch.

Rig pumps are used frequently to put the cement away after it has been mixed. The pumps used on the Superior Oil Company job were the largest ever used in oilfield operations, and also are the only ones utilizing 500-pound steam. Since the pressure necessary was not high, the pumps were run in parallel so as to pump the greatest volume of fluid and thus put the 2500-sack cement batch away in the shortest possible time. It is believed by this company that displacing the cement as rapidly as possible minimizes channeling. In addition to pumping the cement very rapidly, the company raises and lowers the casing during the entire period the cementing job is being perfomed. On this particular job the 11,528-foot string was raised and lowered 10 feet continuously.

Passage of large volumes of slurry at high velocity evidently had no harmful effect on the interior construction of the float shoe and collars, since the ball valve functioned perfectly and prevented return of the cement into the casing after the plugs had bumped.

After the discovery of 13,000-foot production at Wasco in an interesting completion procedure by Continental Oil Company, details of which are presented in an article on deep-well completion in this issue, Standard Oil Company of California set casing at 13,001 feet in KCL-8. This string consist-

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ed of 7-inch O.D. smooth-joint pipe, the total length of which was 13,019 feet, or 18 feet above the derrick floor, and was run through 10¾-inch pipe cemented at 7505 feet and in a 9⅝-inch hole drilled to 13,048 feet. The string, made up with float shoe on bottom and a float collar one joint above, was floated in to 12,859 feet.

It was estimated that 1200 sacks would bring the cement up behind the 7-inch casing to the shoe of the 10¾-inch string, and in order to be sure of this an additional 300 sacks were used to provide for dissipation of the slurry and the cement left in the casing. The cement used was designed to set in 3.5 hours and was mixed to make a 118-pound per cubic foot slurry. The pressure gradually built up to 1800 pounds before all the cement had been displaced. Connections were changed on the cementing pumps and a final pressure of 2500 pounds was built up, but without putting away any more cement. The subsequent water shutoff test showed a successful job.

Conclusions

Cementing practices vary somewhat in the various producing districts, but several accepted basic principles are recognized. Standardization between the different producing districts has not been fully accomplished, but committees are working toward that end. Some of the specifications suggested for cement are considered severe and difficult to meet. Several cementing axioms more or less recognized in all producing areas follow:

1. The well represents a large investment at the time the cementing operation occurs. Regardless of the safety factor provided by equipment and materials used on the job, every possible hazard that can be anticipated should be eliminated and the job should be completed with as little delay as possible.

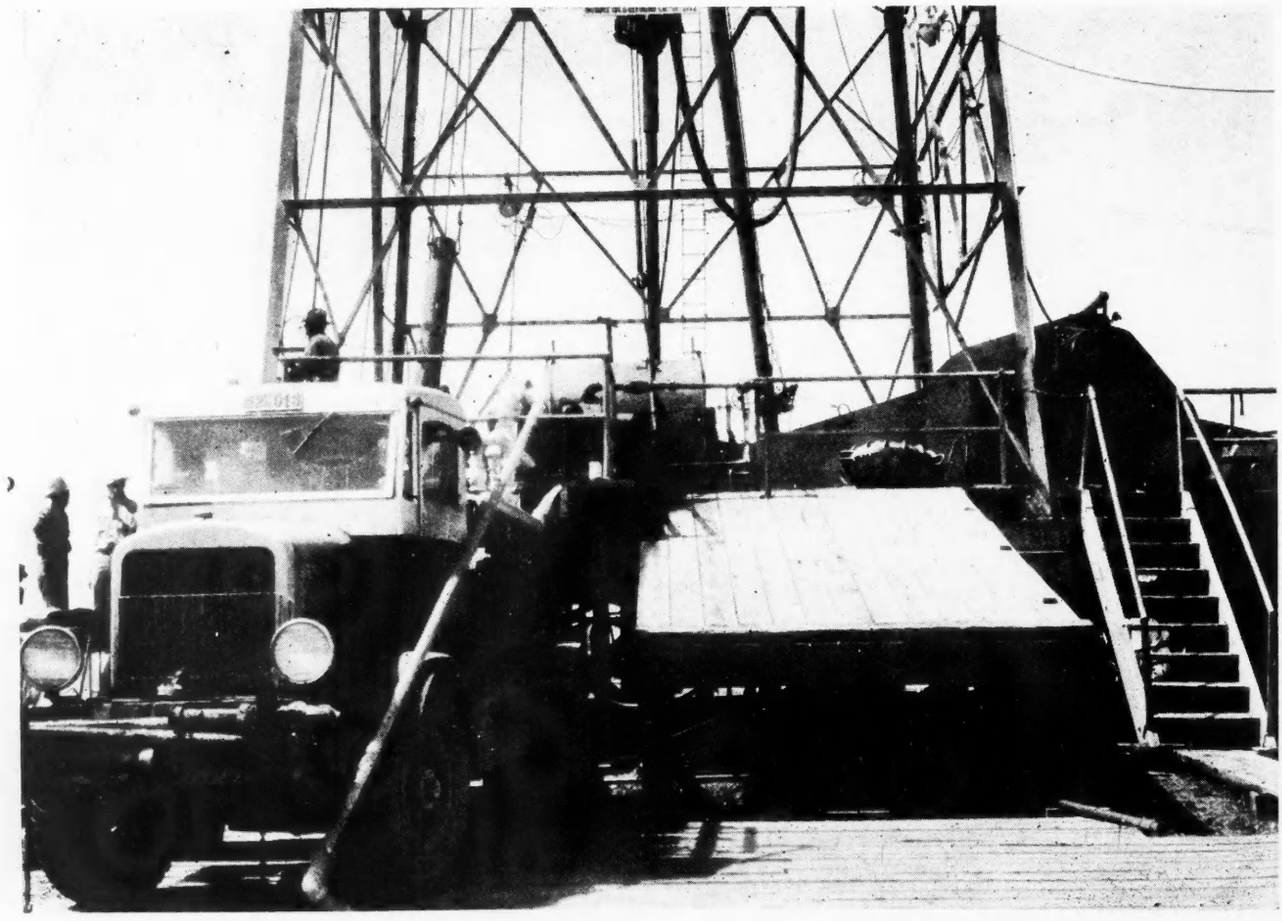
2. The well bore should be conditioned properly before running casing, and the diameter of the well bore should be sufficient to provide space for a satisfactory volume of cement back of the casing.

3. The rotary mud should receive constant attention during the entire period of casing and cementing. The viscosity should be maintained as low as is consistent with the density required for the well condition. At the conclusion of running casing, the rotary mud in the well should be replaced with well conditioned mud from the pits.

4. Estimating the time of the cementing operation within minutes should never be attempted. Anything can happen. The cement used should remain pumpable well beyond the time alloted for pumping the cement in place. This principle applies to cementing operations of all types.

5. Cementing equipment and cement should be selected on the basis of quality and adaptibility to conditions.

6. The amount of cement used should be considerably more than that shown by calculations. From 50 to 100 percent more than this amount gives best results.



A typical cementing operation in a deep South Louisiana field is shown. Temperatures above 350° F. and bottom hole pressures above 7500 pounds per square inch have been encountered.

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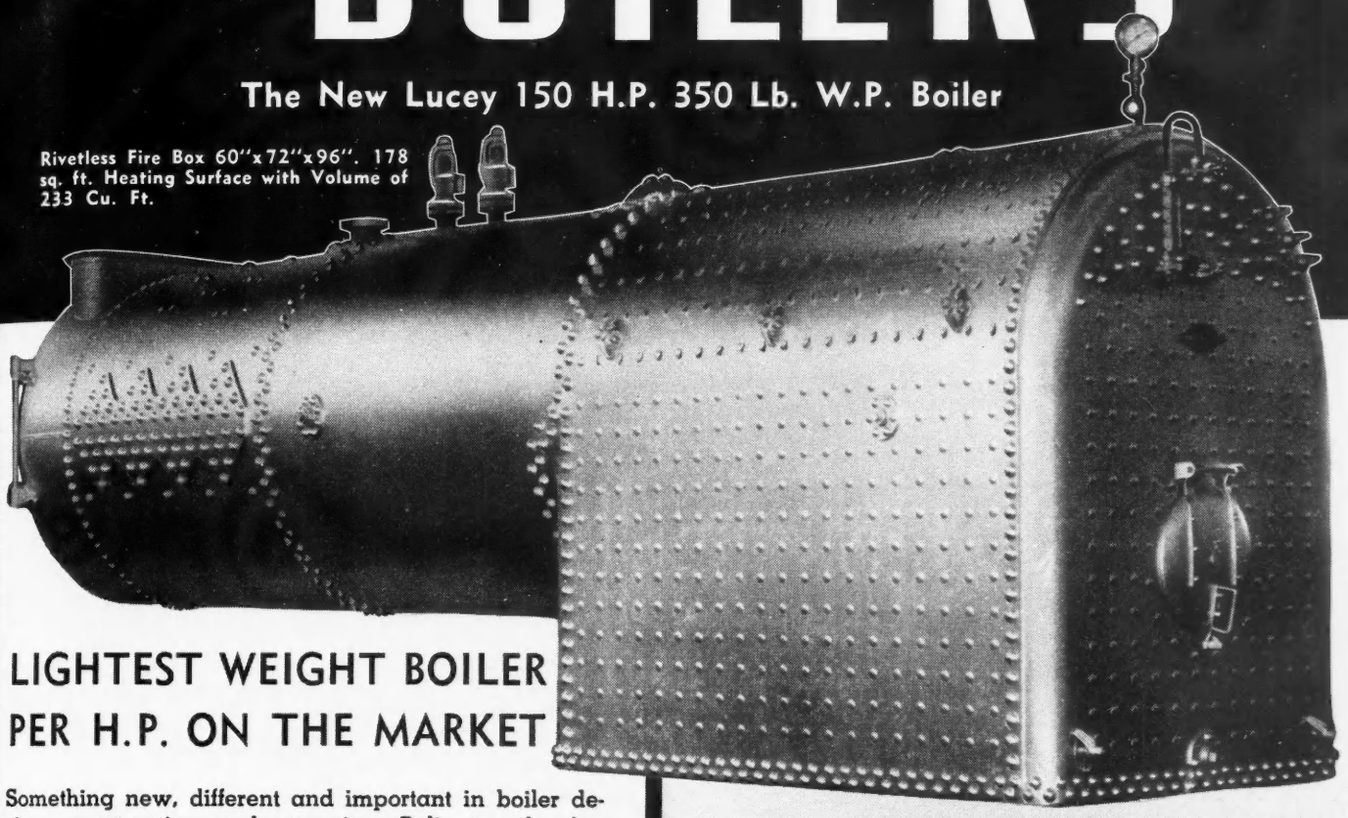

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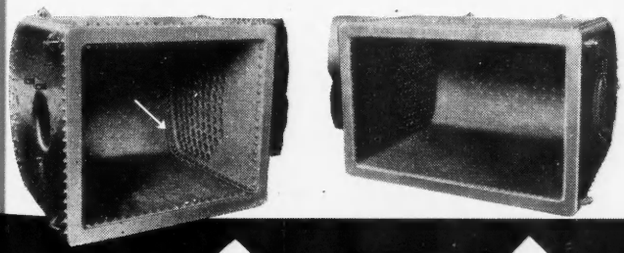

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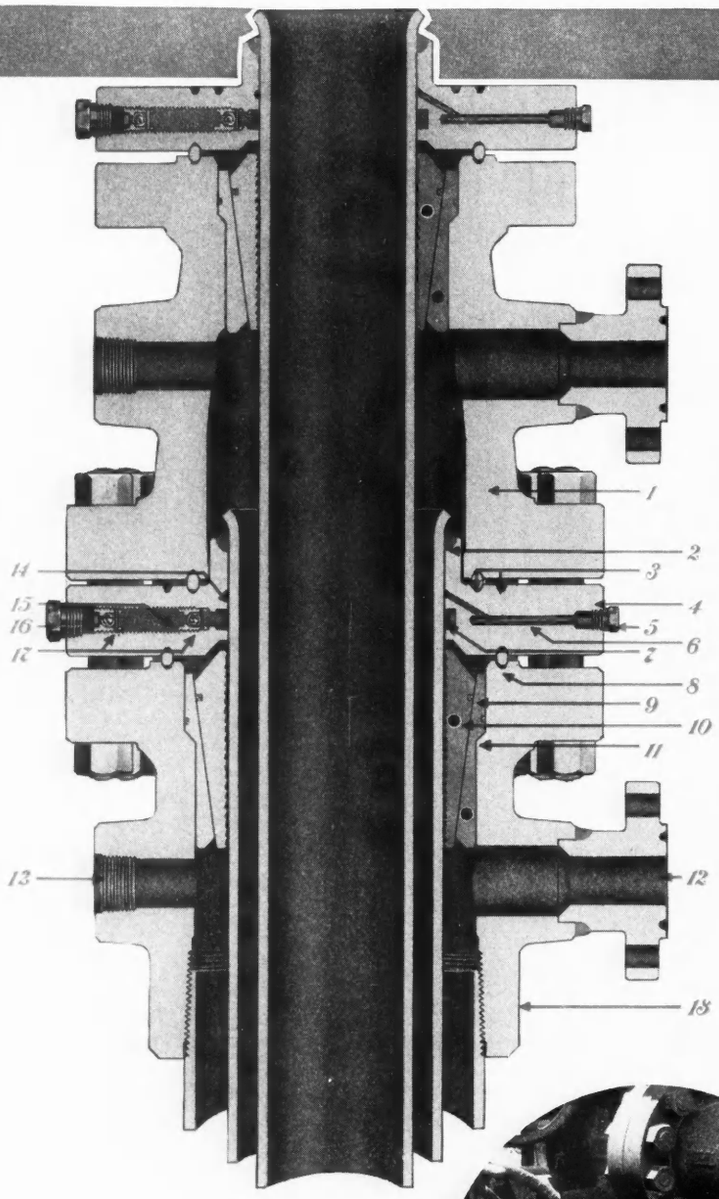
CAMERON CASING HEAD

WITH THE UNIQUE "TEST WELD" FEATURE



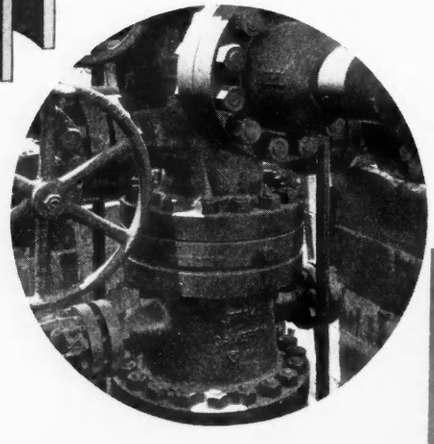
(1) Casing Head Spool; (2) Construction weld; (3) Standard A.P.I. ring groove (outer), restricted ring groove (inner); (4) Type "M" welding flange; (5) ½" pipe plug; (6) Hydraulic test port; (7) Moulded asbestos seal ring; (8) Standard A.P.I. ring groove; (9) Split and doweled slip-bowl; (10) Split and doweled slips; (11) 45-degree tapered supporting shoulder; (12) Flanged or screwed outlets; (13) Casing head housing; (14) Half-round test groove; (15) Plastic packing port; (16) 1" pipe plug; (17) Ball-check type Allen set screws.

Cameron Type "M" Casing Heads and Spools are designed to provide the "last word" in convenience, safety, speed of installation, and pre-tested efficiency under pressure. They provide for slip suspension of casing strings at any desired point in the hole. Seal of the space between strings is accomplished by a heavy construction weld, which prevents pipe from sagging into slips and swaging, and also prevents pipe from rising. Seal between flanges is by means of standard A.P.I. steel ring gaskets. An ingenious provision is made for visually testing the efficiency of each construction weld with hydraulic pressure, thus insuring pressure-tightness before installing casing spool or Christmas Tree.

Slip design permits landing casing at any desired point in the well, and suspending with exactly the correct amount of tension in the string. It eliminates letting-off weight of casing on cement, backing out top joint and cutting nipple, etc., etc. It is quick, simple and convenient. Slip and slip-bowl assemblies are dowel-pinned to insure correct alignment when in place, and even distribution of casing weight. 45 degree bevelled seat in casing head absorbs weight of casing string without spreading or distorting body of head.

When pipe has been suspended, it is cut off above slips as shown. The new Type "M" welding flange is then stripped over and bolted down to the casing head or spool with six studs. Asbestos plastic packing is inserted through a port in the welding flange and, by means of a ball-check Allen set screw, is forced evenly around a moulded asbestos ring recessed into the bore of the welding flange. Plastic packing forces the moulded asbestos ring into pressure-tight contact with the pipe. Construction weld is now applied as shown by Fig. 2 herewith. When weld has cooled, hydraulic pressure is applied through a port on the opposite side of the flange, Fig. 6, which connects with a small, half-round groove located between the moulded asbestos seal ring and the construction weld. Any defects in the weld may be detected and repaired before installing casing head spool or Christmas Tree. After testing, hydraulic pressure is relieved and pipe plug made up in test port. Moulded asbestos ring provides a highly efficient secondary seal of the annular space.

Complete details concerning the Cameron Type "M" Casing Heads and Spools are fully explained and illustrated in a special folder, a copy of which will be forwarded gladly to interested operators on request.



LEFT—Close-up of a Cameron Type "M" 6000-lb. Test Spool on a completed well in the Old Ocean Field, Brazoria County, Texas, where the average depth is 10,500' and pressures range up to 4900 pounds.

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Announcing the new type "J"

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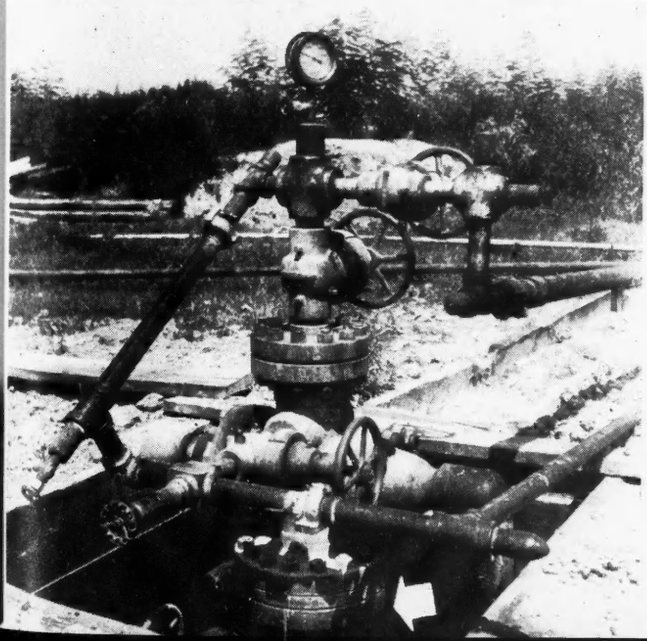
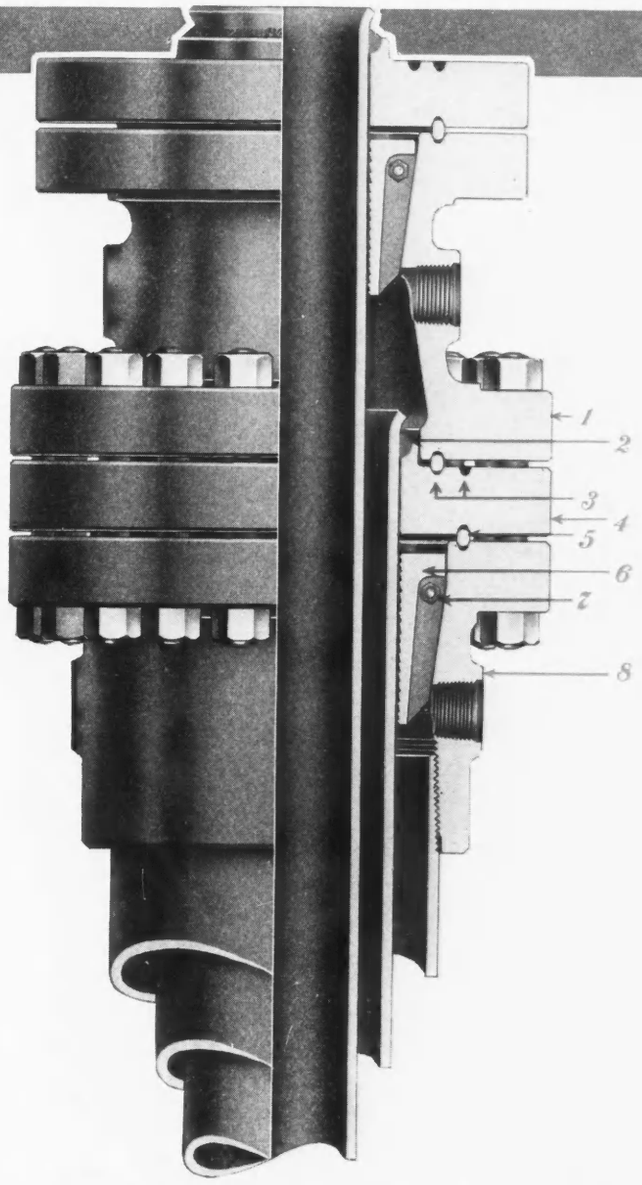
Slip suspension permits landing casing at any point in the well, and suspending with exactly the desired amount of tension in the string. Slip design eliminates letting off weight of casing on cement, backing out top joint and cutting nipple, etc. The slips are assembled around the casing by means of aligning bolts, which insure equal distribution of weight when the casing is landed.

After casing has been suspended, it is cut off above the slips as shown in the cross-section drawing at right, and the Type "J" Welding Flange is then stripped over and bolted down to the casing head or spool with six studs. Construction weld is then applied as shown by Fig. 2 herewith. If desired, a Type "M" Welding Flange can be furnished at a slight additional cost, which provides a unique means for visually testing the efficiency of each construction weld with hydraulic pressure to insure pressure-tightness before installing casing spool or Christmas Tree.

Complete details concerning the Cameron Type "J" Casing Heads and Spools will gladly be furnished to interested operators on request.

BELOW: Cameron Type "J" 4000-lb. Test Casing Head and Cameron Safety Christmas Tree through which the operator tested five sands before completing the well as an eastern extension to the Fairbanks, Harris County, Texas, field.





(1) Casing Head Spool; (2) Construction weld; (3) Standard A.P.I. ring groove (outer), restricted ring groove (inner); (4) Type "J" Welding Flange; (5) Standard A.P.I. ring groove; (6) Split and bolted slips; (7) Aligning bolts; (8) Casing Head housing.

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Deeper Drilling Requires Closer Mud Control

By H. H. FARNHAM, Baroid Sales Department,
National Pigments & Chemical Division of National Lead Company

INHERENT with drilling to greater depths, two factors are encountered that reflect directly upon the performance of drilling mud, and which make it vitally necessary that closer attention be given to the control of its qualities. The first one is the temperature to which the mud is subjected, which in the deeper holes is measured frequently at between 200° F. and 240° F. The second consideration is the increased hydrostatic pressure produced by the mud column at the greater depth. Opposite relatively low-pressure permeable formations this increased hydrostatic pressure greatly increases the differential pressure in favor of the possibility of greater water filtration from the mud, or in extreme cases, total loss of the mud fluid into the horizon being drilled.

In the Gulf Coast area deeper drilling greatly increases the probability of drilling into incompetent horizons or strata in which caving, heaving or sloughing shale occurs. The probability that abnormal gas or water pressures will be encountered also is greater.

General recognition of the existence of these additional hazards in deep operations and to the extreme importance of properly conditioned drilling muds at such levels, has resulted in the widespread adoption of field testing equipment. Consequently, mud control has become a highly developed science that has contributed much to the present ability of penetrating two miles or more below the surface of the earth.

In effect, the principle of mud control deals with balancing the colloidal characteristic of the mud, with its wall-building characteristics and weight in such fashion that the drilling mud will remove the cuttings from the hole as rapidly as they are disengaged, wall up the open hole with as thin a filter cake as is possible and in turn keep the loss of water from the mud to the formation to a minimum, and confine the fluids under pressure to their proper horizons. Other than the characteristic of unit weight or specific gravity of the mud, the characteristic of wall-building (or of filtration behavior) is most important. This quality of the mud is usually determined by subjecting the mud to a filter-press test of 30 minutes duration, in which the apparatus used is a portable filter press of 3-inch diameter and in which the filtration pressure is produced by means of compressed air at a pressure of 100 pounds per square inch. Since this is the most universally used instrument for such determinations, it is common to speak of the wall-building value of the mud in terms of the thickness of the filter cake thus deposited and the number of cubic centimeters of water which have been filtered from the mud during the test. In the following discussion all references to filter cake thicknesses or water loss during filtration tests presumes the use of such instrument.

Higher Temperature Factor

Higher temperatures make for more difficult mud control from two sources. First, although the elevation of temperature actually increases the viscosity and gel strength of the drilling mud, the viscosity of water at temperatures to which it is subjected in the deeper hole is from ½ to ¼ of that which it is when subjected to temperatures in the shallower part of the hole. This means that the rate of filtration of water from the mud under any given set of circumstances will be from one and one half to two times as great at the higher temperature than at the lower temperature. Since the deposition of the filter cake on the walls of the hole is at all times proportional to the rate of filtration of the water from the mud, we can expect thicker walls to be deposited from a mud at the elevated temperature.

The second harmful effect of the elevated temperature is the more rapid destruction of the usual chemical mud thinners which are more or less unstable at temperatures commonly found in the deeper holes. It is the experience of those familiar with the chemical treatment of drilling mud to observe that the quantities of chemical mud thinners required for the usual reduction in viscosity and gel strength of the mud are increased greatly as the depth of the hole progresses. In some extreme cases an occasional treatment with the chemicals will suffice during the first six or seven thousand feet of drilling, whereas, following this depth, almost continuous addition of chemical mud thinners is required to hold a viscosity and gel strength within the desired limits.

The many harmful effects of increasing wall thickness due to increasing temperature is obviated

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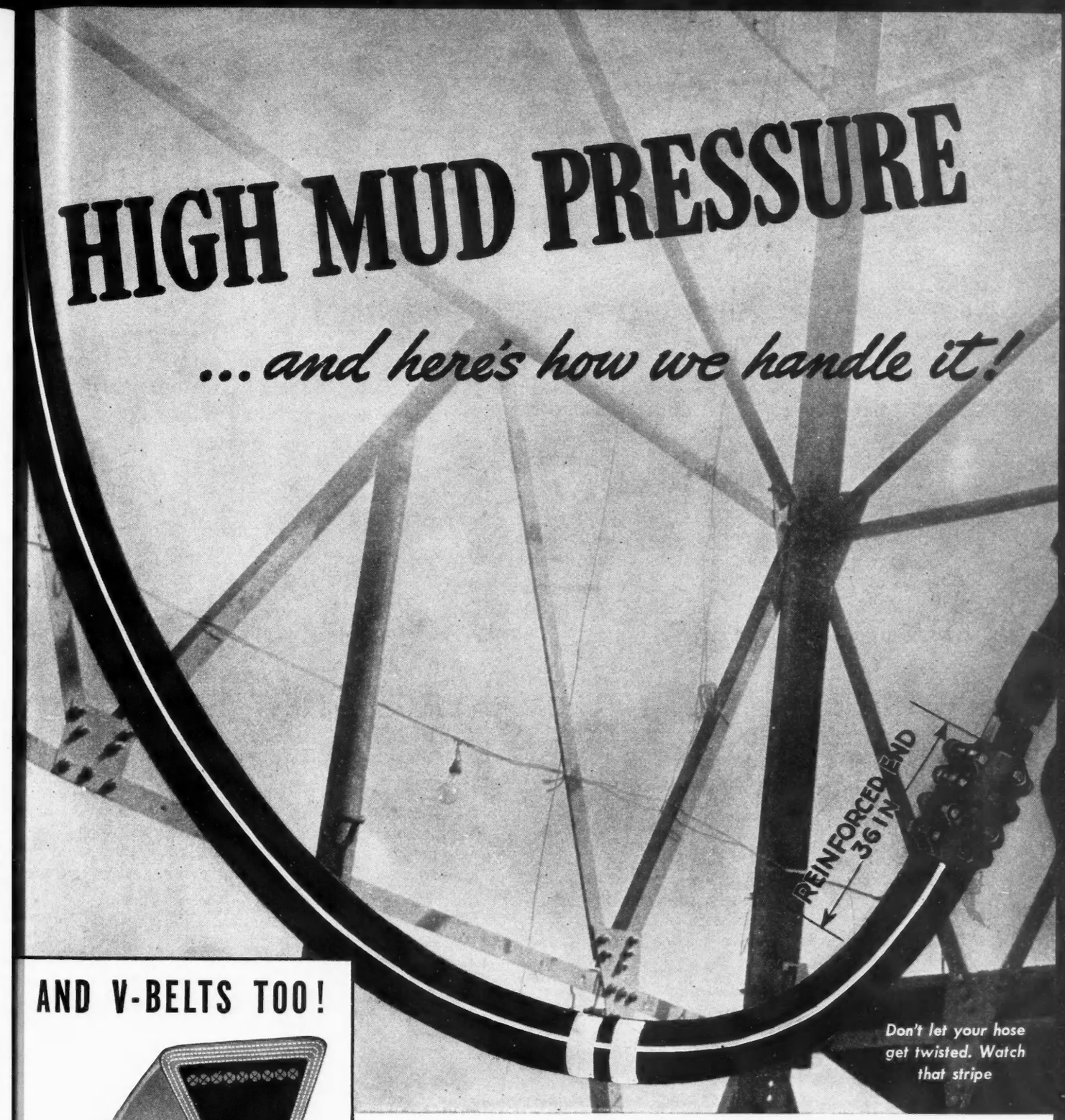

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Deeper Drilling Requires Closer Mud Control

By H. H. FARNHAM, Baroid Sales Department,
National Pigments & Chemical Division of National Lead Company

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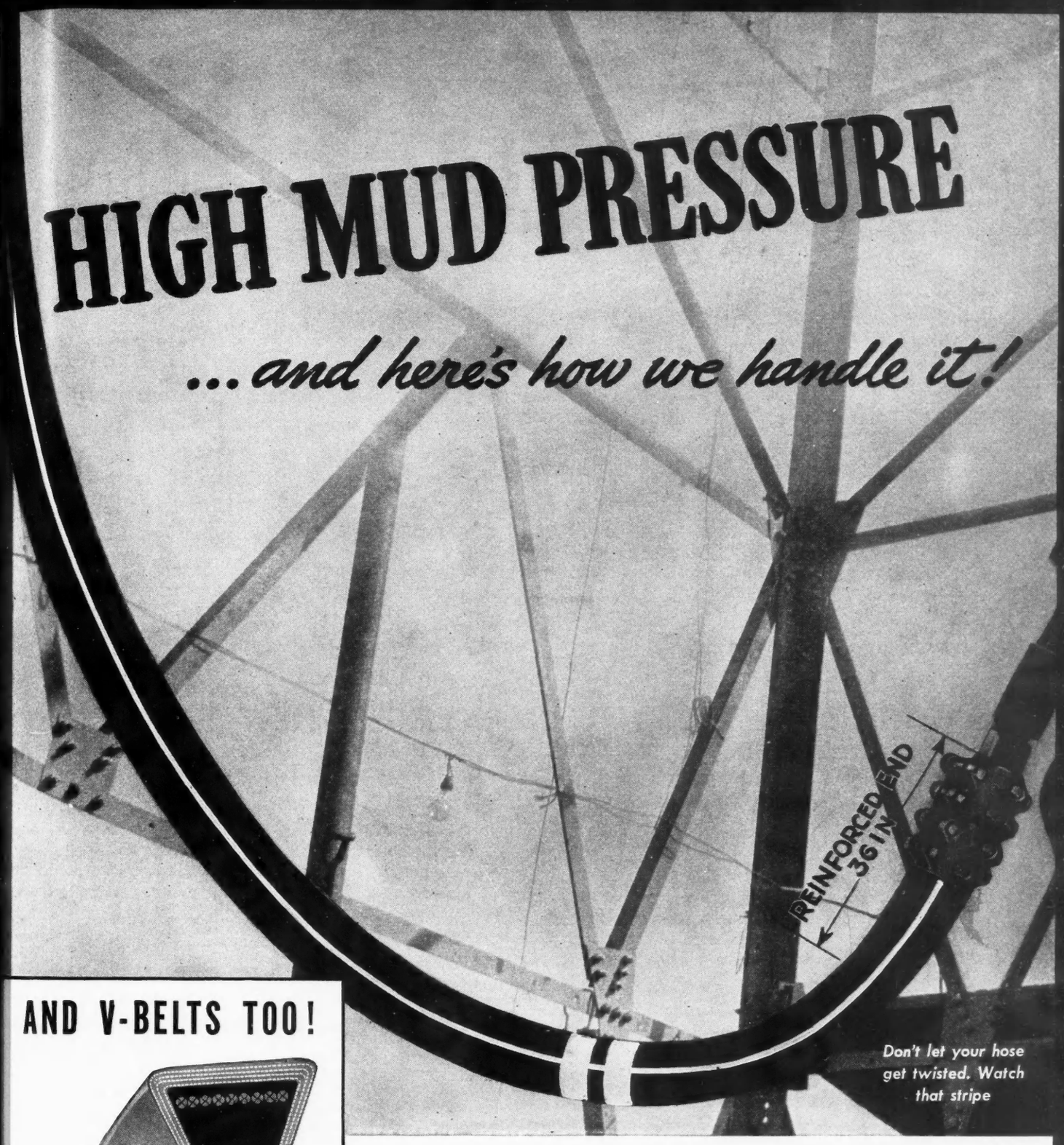

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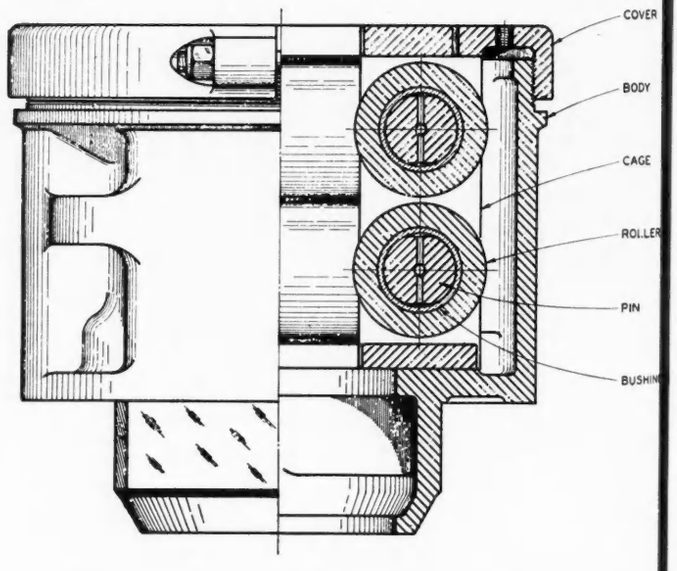
- The additional weight and greatly reduced frictional resistance of the 2R Roller Kelly Drive Bushing makes it unnecessary to use the hold-down locks in the rotary and master-bushings while drilling, reaming, or even when jarring.



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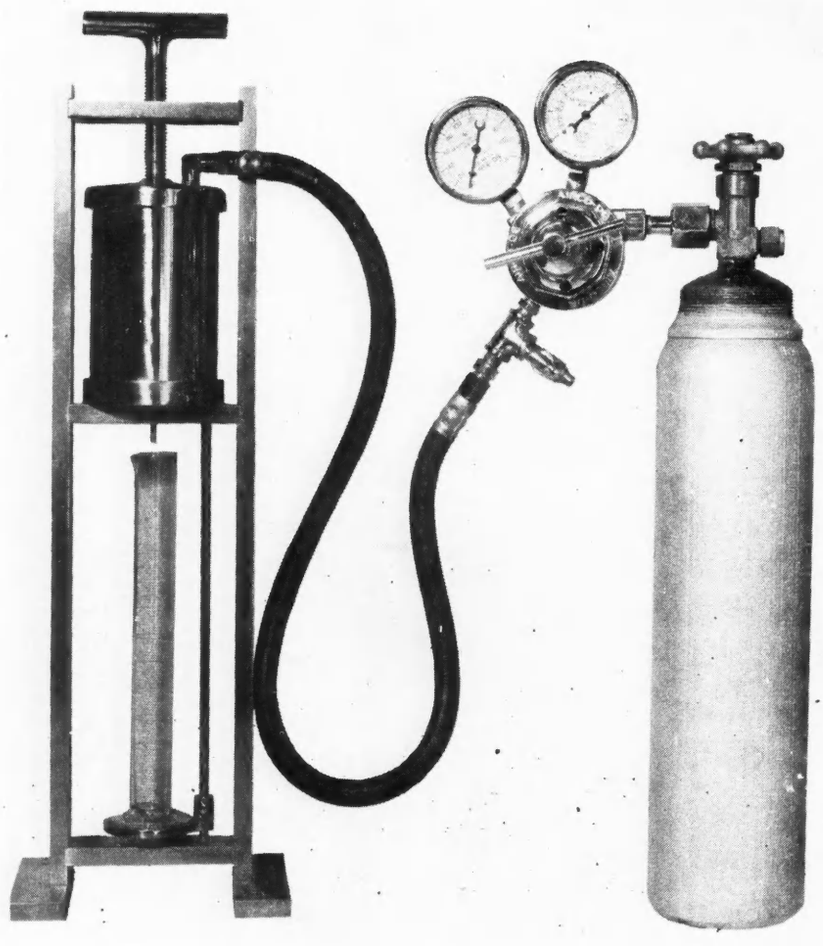
principally by increasing the colloidal content of the mud in as large an amount as is compatible with the necessary weight of the drilling mud. In the 10-pound per gallon range as much as 2 percent by weight bentonite can be added, whereas, in the heavier weighted mud very seldom can more than 1 percent by weight of the mud be added. Furthermore, the continuous addition of small quantities of chemical mud thinners not only offsets the viscosity increase which would be expected by the above addition of the colloidal clay, but also reduces the viscosity and gel strength of the mud which has been increased by its subjection to the elevated temperatures. In addition to this effect, the chemical mud thinners also assist in reducing the wall thickness directly, inasmuch as these chemicals have the ability of breaking up the larger colloidal particles into smaller ones and thereby producing a better particle size gradation, which in turn makes for quicker walling with less-permeable solid aggregate.

The sloughing and heaving shales are greatly aggravated by the infiltration of water from the drilling mud; however, in some cases, even though the water loss from the mud is held to a minimum, it appears some of the shales were so incompetent as to require actual support through the transmission of the hydrostatic pressure of the mud directly to the face of the shale through which the hole is being drilled. In such occasions the mud weight must be increased progressively until a weight is found which prevents the shale from heaving or falling into the hole. There are very few cases where the weight of the mud and its water loss on filtration have been varied independently while drilling in heaving shale, for in most cases at the first indication of heaving, the mud characteristics are changed so as to increase the colloidal content and the unit weight of the mud at the same time. This procedure is continued until heaving stops. However, it is the opinion of most of those familiar with such cases that the increased weight has more to do with the confining of heaving shale than has the reduction of the water loss.

Blowout Defense

The unexpected blowout is an ever-present hazard in deep drilling. Formerly, the only absolute defense against this contingency was proper surface equipment and continuous use of 17-pound per gallon mud which weight has been required in many cases to offset gas and salt water pressures. However, there has been a recently developed well logging method based upon the immediate and continuous examination of the drilling mud as it issues from the flow line. The examination will allow the operator to observe the increasing concentration of gas in the drilling mud and thereby anticipate the approach to horizons, the pressures of which are sufficient to cause either extreme gas cutting or sudden blowouts.

One of the highest recorded pres-



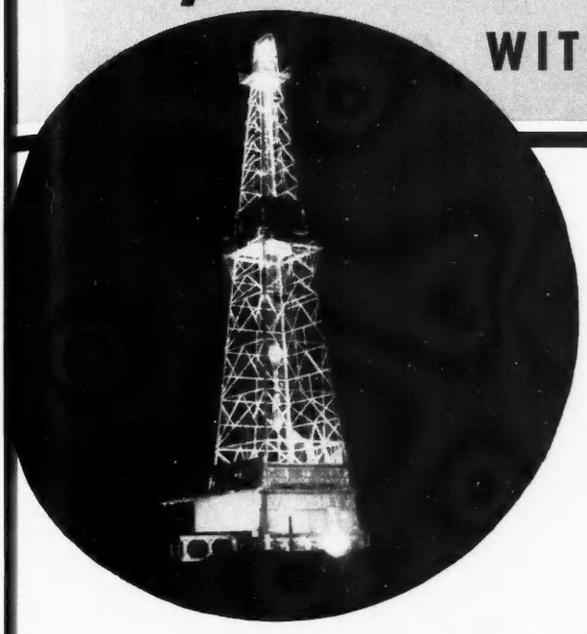
The wall-building characteristics of mud, which becomes a highly important factor in deep drilling, is usually determined by a filtration test, in which a portable filter press apparatus, shown here, is used.

The source of pressure is the compressed air cylinder shown on the right. The pressure is reduced by means of a suitable gauge to 100 pounds per square inch, and is conducted to the top of the filter pressure, shown at left, in which drilling mud has been placed.

After the pressure has been maintained for 30 minutes, the volume of filtrate through the filtering medium in the bottom of the press is observed in the graduate directly beneath. The press is then broken open, the excess mud poured from the press, and the thickness of the filter cake, which has been deposited during the test, can be observed.

rilling to Record Depths-ELECTRICALLY

WITH G-E EQUIPPED DRILLING RIG

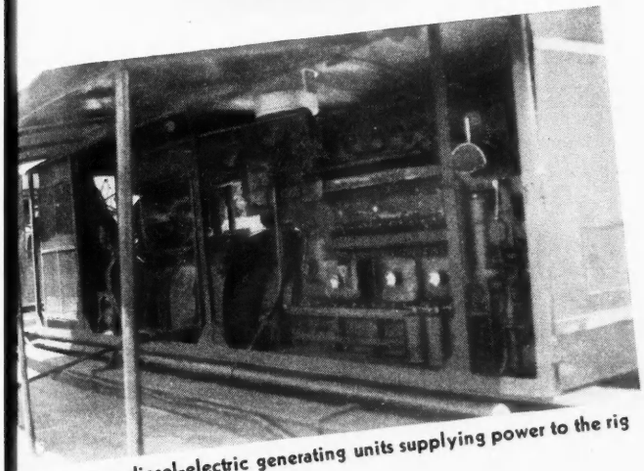


PROCTOR No. 1, a wildcat well being drilled near Elk City, Oklahoma, by the Fain Drilling Company, of Oklahoma City, for the Continental Oil Company, recently passed the Oklahoma depth record—and is still going down! One of the five deepest-drilling wells in the nation, it's now drilling at approximately 13,300 feet.

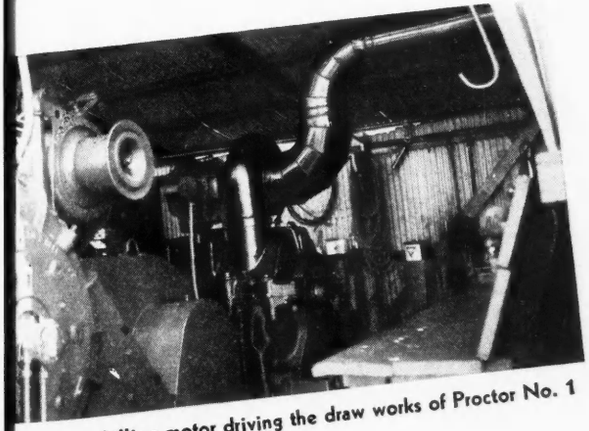
The drilling rig on this deep test, equipped by the Continental Supply Company with diesel-powered G-E direct-current electric drive, has not had a shutdown except to recondition drilling mud, and is making steady progress toward new records. Here are some of the reasons why electricity assists in making more footage in this hole:

1. Fast and snappy operation minimizes the time off bottom to change bits.
2. Flexibility and accuracy of electric control at any speed, with complete stability of engines and motors, facilitate the handling of pipe and casing and assure prompt accomplishment of any delicate fishing operations which might be necessary.
3. Smoothness of speed and control reduces the possibility of mechanical failures and assures unequalled accuracy of manipulation if stuck pipe has to be loosened.
4. Design of the electric equipment prevents stalling of the engines at any motor load—even down to a stalled-motor condition—thus reducing delays and engine troubles.

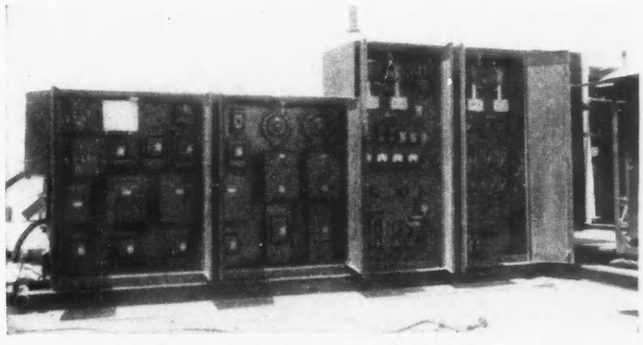
These same advantages, and many others, are available to any purchaser of a G-E equipped direct-current drive. So, when you plan your next rotary rig, specify General Electric. Just call your nearest G-E representative. He will willingly assist you and give you the benefit of long G-E experience in drilling applications. General Electric, Schenectady, N. Y.



ne of the two diesel-electric generating units supplying power to the rig



G-E rotary drilling motor driving the draw works of Proctor No. 1



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WITH 2 WILSON-SNYDER No. 18's

A TRIBUTE TO THE MEN

WHO DRILLED THE WORLD'S DEEPEST WELL . . . . . 12,786 FEET

. . AFTER MEN comes *Equipment*

The skill and courage of man utilized the power and precision of machinery to establish this new world's record.

As Gulf Coast Distributors for Wilson-Snyder Pumps and Kewanee Boilers, both of which were used on this well, we offer our highest praise to the crews who drilled it, and congratulations to the manufacturers for the production of equipment sufficiently powerful and efficient to accomplish such a remarkable feat.

Above are shown the two No. 18 Wilson-Snyder side suction pumps, equipped with suction strainer and flexible hose that were used on this well.

Four 125 H.P., 300-lb. working pressure Kewanee Boilers were used in drilling this record-breaking well.

Wilson Supply Co.

HOUSTON, TEXAS

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and Now!

The "No. 20" Super WILSON-SNYDER

(16¼ x 7¾ x 20 inches)

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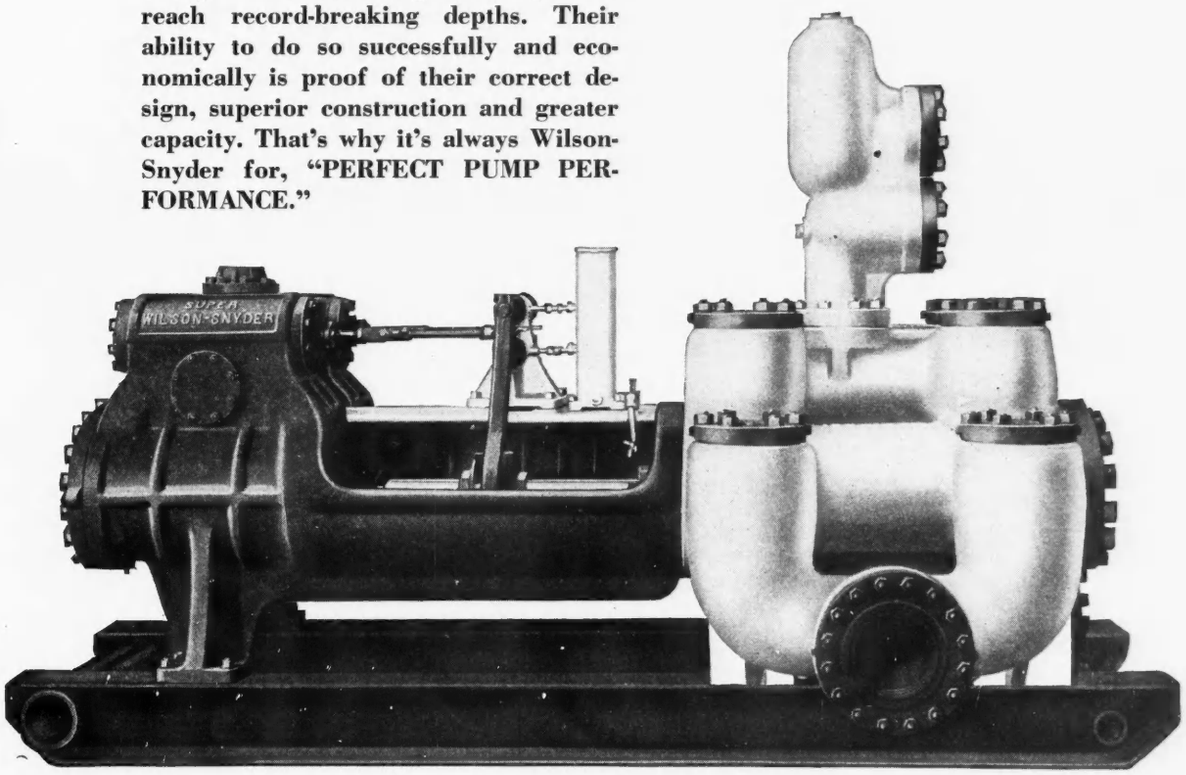
for even greater depths

In numerous instances Wilson-Snyder Pumps have been depended upon to reach record-breaking depths. Their ability to do so successfully and economically is proof of their correct design, superior construction and greater capacity. That's why it's always Wilson-Snyder for, "PERFECT PUMP PERFORMANCE."



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sures with respect to depth on a completed well occurred in Matagorda County, Texas. The closed-in pressure was 6300 pounds per square inch at 9275 feet, which is equivalent to a pressure gradient of 68 pounds per 100 feet of depth. A mud weighing 13.1 pounds per gallon would be required to offset the indicated gauge pressure and the mud weight required to offset the actual bottom-hole pressure would be greater than 13.1 pounds per gallon by the unit weight of the compressed and liquefied gases in the tubing.

One of the highest recorded bottom-hole pressures was measured in South Crowley, Louisiana, at 7700 pounds per square inch at 10,000 feet, which is a pressure gradient of 77 pounds per square inch per 100 feet of depth and equivalent to the pressure produced by a mud weighing 14.8 pounds per gallon.

After a threatening blowout has been shut in with the blowout preventer, the mud in the system must be changed for one sufficiently heavy to produce a hydrostatic pressure of about 500 pounds per square inch above the expected or indicated formation pressure. Since this is usually done with a synthetic mud prepared from weight materials, the substitution mud usually will have sufficient colloidal material incorporated in it to assure good wall-building.

In the case of a blowout in which large quantities of salt water have contaminated the drilling fluid, due to the destructive action of salt upon colloidal matter, from two to six times as much colloidal clay will be required to produce the same walling action as would be if the drilling water were relatively free from salt.

In cases where the salt concentration is above 1 percent by weight of the drilling water, one must resort to extreme quantities of chemical mud thinners, the use of which will restore wall-building properties. One of the most successful treatments of salt-water-contaminated drilling mud is the treatment with caustic soda and quebracho in quantities ranging between 0.25 and 1 percent by weight of the water in the drilling mud. Here again, we are concerned with the filtration characteristics of the drilling mud since the salt-laden mud will be greatly reduced in colloidal content and therefore produce a much thicker wall than would be expected from a similar fresh-water mud. Needless to say, the increased thickness of filter cake will contribute greatly to the possibility of swabbing in additional salt water on each trip and also will interfere with the proper landing of a protection string of casing.

There follows a list of field tests on several muds used in deep drilling in Louisiana together with comments on the significance of the changes.

A well drilling in the Evangeline field, Louisiana, had the following characteristics before it topped the shale that normally gives trouble in this field:

Weight	10.2-lb. per gal.
Viscosity, A.P.I.	51 sec.
Filter Cake Thickness	6/32 in.
Filtrate, 30 min.	18.2 cc.
Sand Content	5% by vol.

At that time a mud-control program was initiated in order to prepare the mud for drilling through the caving and heaving shale. The above test showed that the sand content was entirely too high, that the water loss from the mud was too great, and past experience indicated that a weight of at least 11.5 pounds per gallon should be obtained before drilling through the shale. The mud was first diluted with water and treated with the ordinary treating chemicals in order to allow the sand to drop out. As soon as subsequent tests for sand content showed sufficient reduction, 2 percent of bentonite by weight of the mud was added to the system, in order to increase the colloidal content. Weight material in sufficient quantities to increase the weight to 11.5 pounds was added, and as drilling progressed, the viscosity and gel strength were held constant by the continuous addition of small quantities of treating chemicals. The characteristics of the mud after the above changes were as follows:

Weight	11.5-lb. per gal.
Viscosity, A.P.I.	37 sec.
Filter Cake Thickness	2/32 in.
Water Loss	7.4 cc.
Sand Content	1.6% by vol.

Inasmuch as the shale which was being drilled produced considerable quantities of native mud, it was necessary to add to the drilling system water, colloidal content, weight material and mud-thinning chemicals in such proportion that together with the native mud being produced in the drilling hole the mixture would have essentially the characteristics of the finally prepared mud. As this was done more or less continuously, the mud system never became out of balance.

At Hackberry, Louisiana, considerable trouble was being had with a well which was drilling through heaving shale. The weight of the mud was increased gradually from 10 to 14.6 pounds per gallon before a weight was found which was sufficient to keep the shale in place. Simultaneously, the colloidal content of the mud was increased through the addition of bentonite and mud-thinning chemicals until the water loss on filtration dropped from approximately 20 cc. to 4.7 cc. In this well, even though the weight was maintained at 14.6 pounds per gallon, it was observed that filtration water losses greater than 10 cc. on the portable filter press would induce the shale to cave and heave. The low filtration loss of approximately 4.7 cc. was maintained throughout the remainder of the drilling of the well through the continuous addition of small quantities of bentonite and mud-thinning chemicals.

One of the wells which encountered high-pressure salt water required a mud weighing 17 pounds per gallon to kill it and to proceed with drilling. Since the mud system was contaminated greatly with salt water, the usual great cake thickness and high filtration loss occurred. This mud had the following characteristics:

Weight	17.0-lb. per gal.
Viscosity	Plastic
Filtrate	119 cc.
Cake Thickness	24/32 in.
Salt Content	2.7%

This mud was treated with ¾ of 1 percent by weight of both caustic soda and quebracho, plus 1 percent bentonite, and the resulting mud had the following characteristics:

Weight	17.0-lb. per gal.
Viscosity, A.P.I.	45 sec.
Filtrate	20 cc.
Cake Thickness	6/32 in.
Salt Content	2.7%

The widespread adoption of field testing mud equipment such as the hydrometer, the viscosimeter, the pH tester and the portable wall-building tester in the areas that present mud problems speaks well for the general acceptance of the need for accurate technical mud control, which to a very large extent is responsible for the ability to drill wells to 10,000 feet and more today.

32 DEEP WELLS

Drilled by one Submersible Drilling Barge

A single submersible drilling barge, placed in service November 17, 1933 by The Texas Company has achieved an enviable record of rapid, efficient, low cost operation.

To date it has served to drill 32 wells, the deepest being 10,766 feet.

In changing locations 32 times the barge has been moved as far as 80 miles. These changes have required an average time of only 36 hours from the completion of one well to start the next, when there have been no delays in choosing the new drilling location.

Nearly six years old, this barge has now been equipped with a heavy rig capable of drilling 15,000 feet and is expected to continue its usefulness for at least 10 more years.

As this barge's record has demonstrated, the submersible drilling barge more than pays for itself in lower drilling costs, more rapid production, reduced fire hazard, increased stability, reduced maintenance, time savings, and flexibility of operation.

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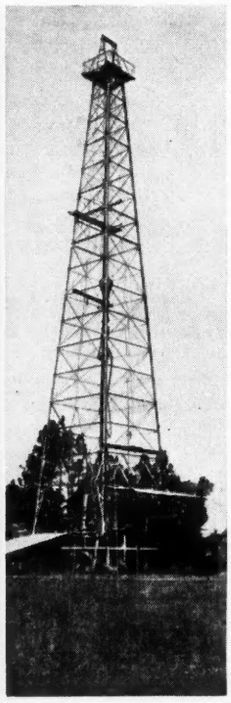
"WHEN IT COMES TO SURVEYS, LOOK TO SPERRY-SUN"

And take a look now at these three remarkable records — made by Sperry-Sun instruments in the last few months!



Record No. 1

A Sperry-Sun Surveying Record made for

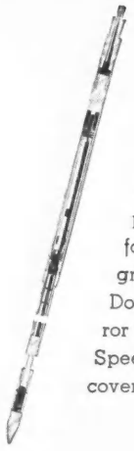
UNION SULPHUR COMPANY

with the Sperry-Sun H-K Single Shot. Five months in continuous service **without repairs or replacements!**

196 pictures in over 46,000 feet! No repairs—no replacements! It sounds like a derrick man's dream—but it's the actual performance record of an H-K Single Shot instrument used in the Union Sulphur Company's development at Woodlawn, La.

No kid-glove handling helped to make this record possible, either. The instrument was handled by twenty different men. The company has had two rigs in the field constantly, and the instrument was transported from one to the other in a small truck, taking the rough with the smooth.

Name of Well	Depth in feet
Racca No. 1	8,911
Calcasieu Bank No. 1	8,905
Thomas No. 1	9,552
Miller No. 2 (still drilling)	9,111
Donovan O'Connor No. 1 (still drilling)	8,159
Donovan O'Connor No. 2 (side-tracked hole)	2,283
	46,921 feet



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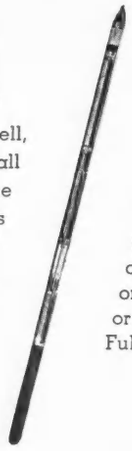
provides a map of the well, photographically at all depths and affords a true picture of drilling progress for both direction and degree of vertical variation. Doubly checked against error by "in and out" survey. Speedy and accurate. Fully covered by patents.



Self-Checking SYFO Clinograph

A quick, inexpensive daily record of vertical deviation in drilling, without the use of dangerous acids. Used on wire line, as "Go-Devil" or on sand or bailing line. Fully patented.

Self-Checking H-K Clinograph

Designed for open holes only—providing permanent, accurate, photographic records of inclination and direction on paper discs five minutes after removing instruments from hole. Fully patented.

Record No. 2

A Sperry-Sun
Surveying Record made for

CONTINENTAL OIL COMPANY

• • •

Continental Oil Company's deep well at Wasco was double surveyed to a depth of 11,500 feet with the "SURWEL" Gyroscopic Clinograph on a wire line.

In-run started at — 10h 16m 35 sec.
Bottom reached at — 11h 36m 12 sec.
Out-run completed at — 12h 53m 47 sec.
Total time for two surveys — 2h 37m 12 sec.
Closure between In and Out-run — 9.3'
Maximum temperature recorded — 210° F.
Records taken every 100 feet

Record No. 3

A Sperry-Sun
Surveying Record made for

THE SUPERIOR OIL COMPANY

• • •

The Superior Oil Company's deep well at Rio Bravo, California, was double surveyed when at a depth of 11,322 feet with the "SURWEL" Gyroscopic Clinograph attached to the drill pipe making the round trip in 5½ hours.

FROM THE LOG

In-run started at — 9h 28m 00 sec.
Bottom reached at — 11h 41m 00 sec.
Out-run completed at — 2h 55m 00 sec.
Total time for two surveys — 5h 27m 00 sec.
Closure between In and Out-run — 6.1'
Maximum temperature recorded — 218° F.
Records taken every 45 feet

A NEW CORE ORIENTATION SERVICE

Sperry-Sun's Polar Core Orientation (U.S. Patents 1,792,639; 1,778,981; 2,089,216; 2,104,752; 2,105,650; 2,149,715; 2,149,716; 2,149,717 and others pending) does not interfere with the progress of drilling. The orientation is determined in our laboratory, to which the selected cores taken by any type of core barrel in the ordinary course of drilling and properly marked, are shipped from any distances. No special equipment is required at the well . . . there is no loss of drilling time.

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Significant Strides in Deep Well Completion

By I. W. ALCORN, Division Production Engineer
The Pure Oil Company, Houston

PRIOR to 1937 there were no successful completions made in excess of 10,000 feet, although a number of attempts had been tried on tests drilled to and beyond this level that had encountered showings indicating commercial production. Today, wells are being completed with regularity at this depth, and even down to 13,266 feet. California alone had 52 wells making oil from below 10,000 feet on July 1 this year.

The present ability to bring in production at such depths in contrast with the 100 percent failures that existed previous to January, 1937, is indicative that truly vast advancements have been achieved in this important phase of the oil business in a very short period.

Completion of deep wells (10,000 feet plus) has been made possible by important improvements in all manner of equipment and through development of new and unique methods. Oil-well-completion technique varies in the different deep-producing localities to fulfill exacting requirements demanded by specific productive strata. Increased flexibility of modern procedures is a significant development, as this aids in permitting practices to be varied to meet particular conditions existing at present or unforeseen future situations that may arise. Interesting innovations in bottom-hole settings, and in methods of controlling high-pressure wells while making settings have been developed, while washing-in control technique has been improved to provide complete safety despite the higher pressures found at greater depths. Exclusion of troublesome strata and inclusion of preferred zones form the basis for modern deep-well-completion practices.

For the support of long strings of casing and tubing and proper sealing against very high pressures, improved types of hangers and heads have been designed by manufacturers. Modern wellhead equipment also will permit complete reworking of wells under positive pressure control, from the cutting and pulling, drilling out or cementing off of old bottom assemblies to the installation of new ones. This becomes of importance in deep wells. The fundamental reason for this trend is not that such work necessarily will be done under extremely high pressures, but that it may be performed when the bottom-hole pressures are so reduced that it would be unwise to kill the well by subjecting the producing sand, in the case of a deep hole, to the hydrostatic pressure of a mud column that would be two or three times greater than that of the formation.

Tapered-weight casing strings have been used in California, which are less expensive and reduce the weight considerably. Tide Water Associated Oil Company recently ran five different weights of 7-inch O. D. casing in KCL-61, completed below 10,000 feet in the Coles Levee field of California. The taper designation in this instance applies only to weight and not to the diameter of the pipe. The production string in this well included 3200 feet of 30-pound Grade D pipe; 800 feet of 30-pound Grade C; 1100 feet of 28-pound Grade C; 1800 feet of 26-pound Grade C; and 3300 feet of 24-pound Grade C.

In running tapered weight strings of casing consideration must be given to collapse and tension stresses. Generally speaking, the heavier weights are run on bottom because collapse stresses exceed tensions. However, this is not always true and the lighter weights may be run in the center of the string, with the heavier sections on both top and bottom to gain sufficient safety factors for both tension and collapse. The fashion of running the pipe would depend on the conditions existing. The general practice in the field is to have safety factors of 2 in tension and 1½ in collapse, although manufacturers recommend 2½ and 2.

True testing of any horizon is dependent on a successful cementing operation, and it cannot be stressed too much that all the care possible be exercised in cementing. If multiple-sand conditions exist over a large section of the hole, then either multi-stage or squeeze cementing above and below the horizons to be tested will provide means for a true production test. Fortunately, there have been phenomenal advancements in both cements and cementing technique, as discussed in another article in this issue.

Methods of bottom-hole completing may be classified into several general types, including the following: (1) screen or slotted pipe and liner assembly below casing landed at the top of the producing strata or slightly below that point; (2) blank casing set on bottom and perforated at desired points; (3) combination screen-liner and gun perforation, in which the casing is set on bottom and perforated, with the screen or slotted pipe and liner assembly run inside; (4) full-hole screen completion, in which screen or slotted pipe is run on bottom of the cas-

• Continental Oil's KCL-A2, the rig that drilled the world's deepest well, with the help of Rex Champion Chabelco Chain.

REX CHAMPION CHABELCO

ON THE RIG THAT DRILLED THE WORLD'S DEEPEST WELL!

• Last year the bit on Continental Oil's KCL-A2 well reached the record depth of 15,004 feet. As is so often the case where speeds are high and the oil lies deep, Rex Champion Chabelco chain was on the rig which set this still unbroken record.

Whether you're drilling shallow or deep, there are Rex Chabelco Oil Well Chains to meet all your requirements of speed, power, depth of hole and type of drilling—to help you gain more drilling footage out of every chain dollar spent.

Rex Chabelco Chain has a positive pin lock that defeats destruction at the joints. It is precision-made of alloy steels, treated for extreme bearing hardness and unusual toughness. It has especially effective lubricating methods. This Rex design is insurance against all chain troubles on any drilling job!

Write for your copy of the new Rex Chain Data Book which contains detailed and specific information that will make your chain selection job easier and safer! The Chain Belt Company, 1639 W. Bruce St., Milwaukee, Wis.

SOLD FROM STOCK BY LEADING SUPPLY HOUSES IN OIL FIELDS THE WORLD OVER

REX CHAIN

CHAIN BELT COMPANY OF MILWAUKEE

Running a gun perforator does not involve unusual hazards, despite the great penetrating power of each projectile. The operation shown here is in a South Louisiana well.

ing string. There are several variations of these procedures in use by different oil companies.

Gun Perforating

In the straight gun-perforated bottom-hole setting a full-gauge hole is drilled to bottom, blank casing is then run to bottom, cemented and gun-perforated. This permits flexibility in testing various sand levels, as undesired zones may be cemented off at any time and new perforations made.

One unusual method employing the perforator for testing a formation, when the sand in question has been drilled with full-hole gauge, involves lowering a short string of casing in on the drill pipe and cementing it opposite the formation. The perforations are made inside this short string. If a satisfactory test is obtained, then a long string of casing of smaller diameter is run to bottom and cemented. Both strings are then perforated and the well completed. The success of this type of work depends upon good hole conditions, i.e., good mud and no caving walls.

Wells of extreme depths generally employ muds of heavy weights and high gel qualities. The bottom-hole temperatures are high and tend to increase the gelation of the mud. It is good practice to circulate long enough before running the perforator to provide a good clean bottom. Sometimes a defloculating agent is used in the mud to separate the cement from the mud in the pits and to reduce viscosity. By reducing the viscosity the gun may be run in and out of the hole in a shorter time.

Measurements are always a most important factor in perforating and become increasingly so at great depths. Drill pipe or tubing measured in strain has been accepted by many for checking perforating zones.

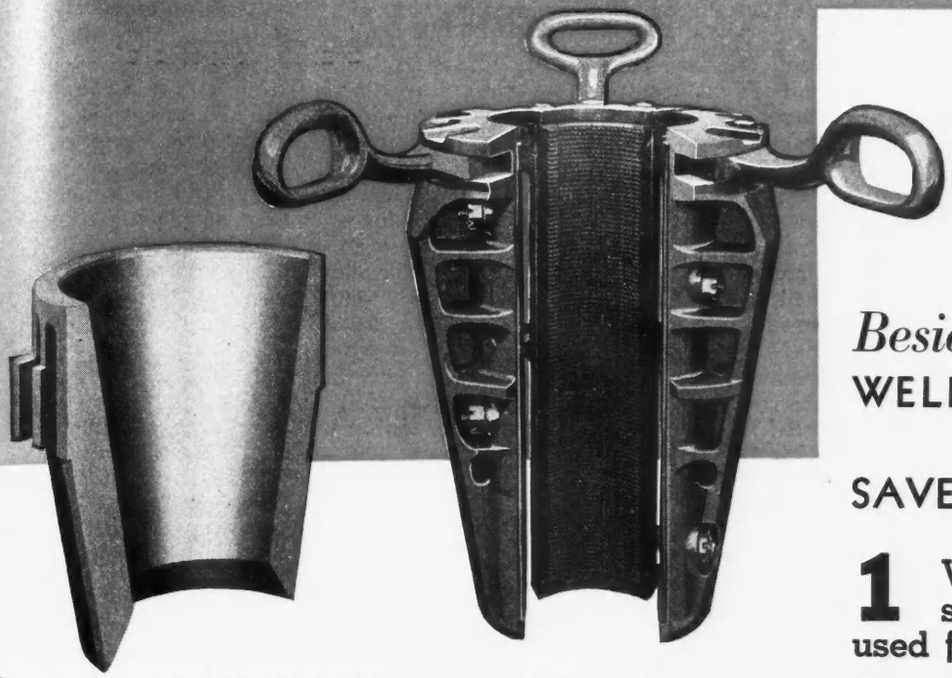
Immediately following the removal of the circulating string, the blowout preventer or stuffing box is connected on a nipple of sufficient length to permit the removal of the gun from the well under pressure. This nipple is connected above the master valve. This stuffing box is tested under 2000 pounds and the line may be pulled under this pressure. The gun is lowered into the well, and line measurements are made by devices calibrated against drill pipe measured in strain.

True bottom is ascertained by at least one service firm through the use of a sensitive weight indicator that is hung directly over the hole and instantly measures changes of weight on the gun line. In this manner, false bottom readings caused by gelling mud or any foreign objects may be determined readily. Often in deep wells the mud becomes so heavy at lower levels that the gun has to be spudded through it to reach true bottom.

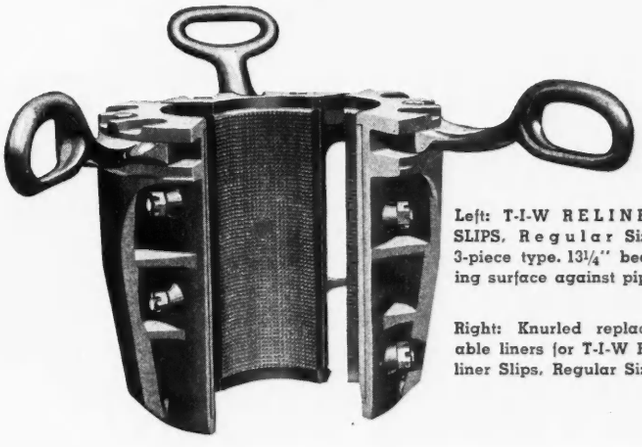
Other methods of measuring the gun perforator into the well are employed also. One perforating company uses the distance over the derrick from the hoisting drum to the well head as a unit for measuring to any depth in the well, this method usually employing the bailing line, sand line or drilling line. Another company doing gun-perforating work measures the gun perforator into the well with the same cable and the same weight on the cable as was used for the electrical logging of the well.

With increasing depth, the collapse factor of casing is approached, and careful firing is a requirement. Some perforating tools

T-I-W SLIPS *Favorites on*



Above: T-I-W LONG RELINER SLIPS, 3-piece type with adapter which makes 62% added length possible, giving 20" bearing surface against pipe.



Left: T-I-W RELINER SLIPS, Regular Size, 3-piece type. 13¼" bearing surface against pipe.

Right: Knurled replaceable liners for T-I-W Reliner Slips, Regular Size.

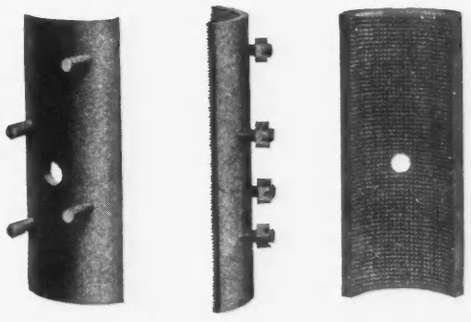
T-I-W RELINER SLIPS, 2-piece type; also liners for same. 13¼" bearing surface against pipe.

WORLD'S DEEPEST WELLS

Besides getting DEEP WELL DEPENDABILITY YOU ALSO SAVE MONEY BECAUSE:

1 With T-I-W Slips, the same housing can be used for many sizes of pipe.

For example, the 4½" housing takes 2⅜" O.D. to 5" O.D. pipe.



2 Liners can be resharpened many times.

Liners can be replaced when completely worn. Saves buying a complete new set of slips when after long use and resharpening many times, the liners finally wear out.

FOR BETTER RESHARPENING OF T-I-W LINERS, SEND THEM TO T-I-W SHOPS.

SUPERIORITY OF T-I-W SLIPS KNOWN AROUND THE GLOBE
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have a safety feature so that removal can be made in a minimum of time in case they become fouled or stuck. For this purpose, one perforating company has developed a reliable pull-out cable head on the gun, making it possible to pull the cable head from the gun, avoiding the difficult job of fishing the cable out of the hole, and permits an overshot to be run over the gun for removal.

Wells Using Screens

In the standard or conventional screen or slotted-pipe completion method, the bottom-hole assembly consists of a set shoe, tubing, screen, liner and liner packer.

The most common procedure is to either set the casing on top of the producing sand or slightly below the oil-gas contact. In which case, a smaller hole is drilled below this point to the bottom of the well to accomodate the bottom-hole setting.

However, blank casing may be run to the bottom of the hole, be cemented and gun perforated, after which a bottom-hole screen assembly is run inside the oil string. For the latter type of completion a joint of blank pipe usually is placed opposite the perforations, with a back-pressure valve between it and the screen or slotted pipe section spaced above. It is usually customary with this procedure to provide a sand trap in which sand entering the hole may settle, by setting the plug 20 to 50 feet below the perforations. Some concerns using this method either gravel-pack or use some other filter medium around the screen and blank pipe sections.

The screen assembly, in either of the above practices, is run into the well on the tubing string, the tubing or wash pipe passing through the liner and screen to connect to a positive-closing valve in the set shoe. After the shoe is closed and the tubing is released, the latter is raised and lowered several times to tightly compress the packer. Pump pressure may be applied to determine if the packer and shoe have set properly.

Since these operations are conducted through a stuffing box at the well head, the well usually is allowed to flow a little before setting the packer. After the packer is set, the tubing is hung in the well head and the well allowed to produce.

In many cases in deep high-pressure wells, it is desired to have the pressure only on the tubing, in which case the tubing may be sealed off from the casing. This may be done by using a tubing packer with synthetic rubber seal. A safety advantage is keeping the high pressure off of the casing, which may leak into and charge upper sands. Also by confining all flow and pressure to the tubing, a velocity-closing valve may be installed in the tubing, which will close in case of increased flow velocity caused by damage to the Christmas tree, such as might occur from sand cutting or in the case of the numerous deep South Louisiana wells from a tropical hurricane. This then would have the well shut in completely below the surface. These velocity valves are put in the tubing about 100 feet below the surface and are removable for swabbing or other work.

Full-Hole-Screen Completion

The full-hole-screen completion method consists of running screen of the same diameter as the casing on the bottom of the casing string. Cementing, which is accomplished by means of ports above the screen and two cement plugs, is not performed until after the screen has been washed.

The method permits the use of larger diameter screen settings than when the bottom-hole assembly is run through the casing on the tubing string, which offers some advantages in small holes.

Drillable Assemblies

A drillable alloy is being used in manufacturing some bottom-hole equipment, because of its ease of being drilled out. The most widely used application has been for regular production liners or screens which are perforated, run and set in any conventional manner. Adapters, liner hangers, packers and other fittings are made of this drillable alloy material also, so the entire bottom-hole assembly is subject to removal with a drilling bit. One screen manufacturer is ready to furnish screen made of this metal, with button inserts of the same material, which will permit the entire screen to be drilled up if desired.

Many of these drillable alloy installations consist of running large diameter liners through the casing, since "wash-over" space is not required and the benefits of larger screening areas are obtained.

Sometimes drillable alloy pipe is combined with steel pipe to form a production string with drillable alloy sections positioned at certain predetermined locations where it is desired to clear the area of pipe when necessary, and in some instances consist of placing a perforated or screened section of drillable alloy pipe through the producing oil zone and placing blank sections of drillable alloy pipe opposite other known oil horizons. When the lower zones become depleted, this section of the string is removed with a wall scraper; a cement plug is set, and the next horizon is opened to production by removing the drillable alloy pipe at this point. Thus, all oil-bearing sands may be exposed and produced through a secondary screen set within the remaining portion of the original liner.

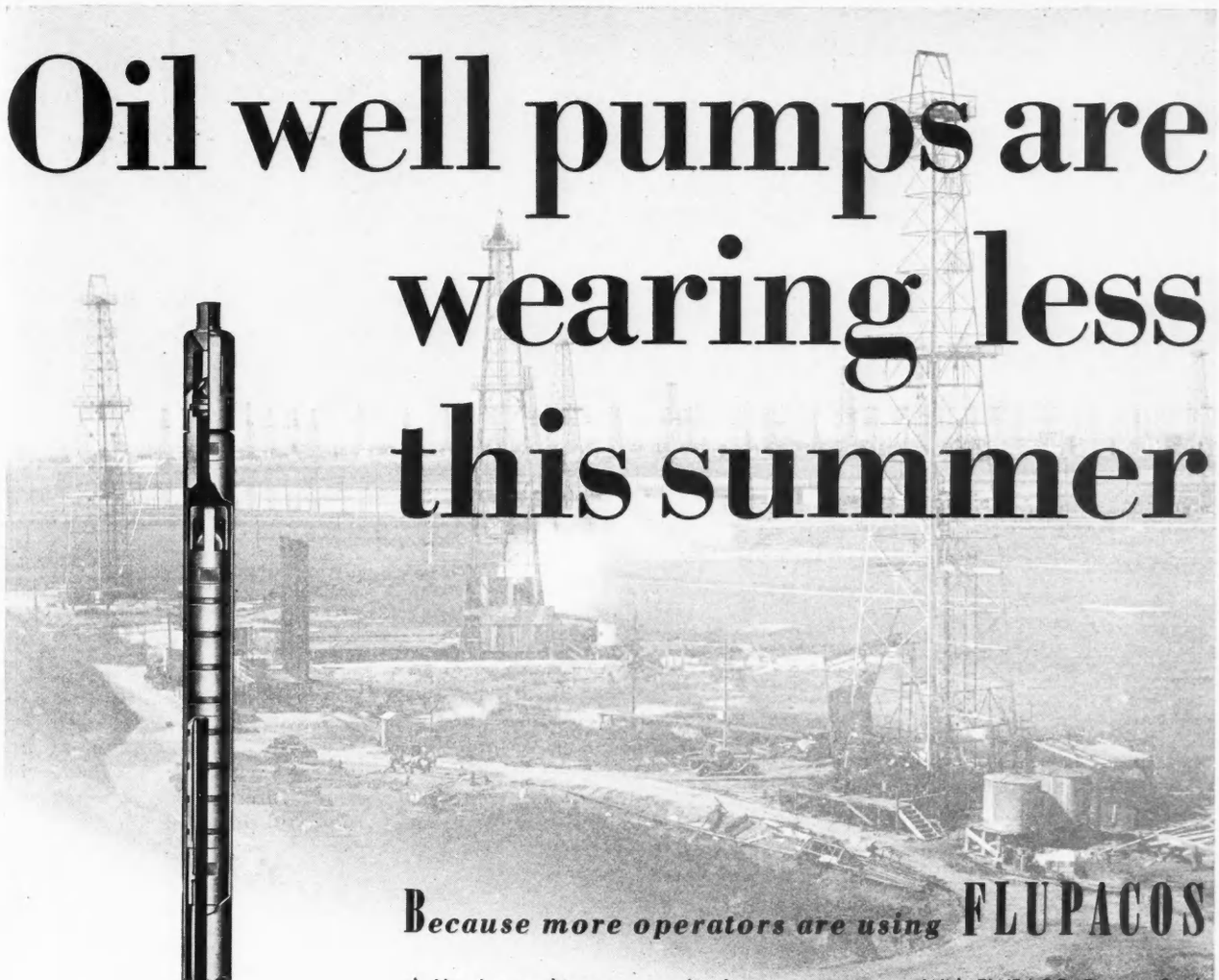
Drillable alloy liners have been cemented in place from top to bottom and through one or more producing zones to effect the exclusion of intermediate water sands and obtain production by means of selective gun perforating. A typical example of this method consists of cementing a full string of blank drillable alloy pipe through all oil sands found between the bottom of the hole and the casing shoe. Perforations are then made opposite the lowest sand. If this zone proves commercially unproductive, a cement plug is set and the section of the liner opposite the next highest sand is perforated. When one of the zones proves of value, the drillable alloy pipe is removed to the bottom of this sand and a regular liner or screen assembly is set in the conventional manner.

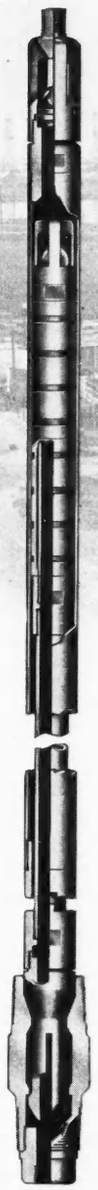
Southern Louisiana

In the Gulf Coast district of Louisiana, where 16 of the 25 fields in the United States producing from below 10,000 feet are located, the problems of well locations have had to be solved as well as those associated with drilling, completing and producing operations. Many of the fields are in swamps, marshes or bays, and drilling is accomplished by the use of submergible barges or piling foundations with the latter type in use for production work.

The operations of The Texas

Oil well pumps are wearing less this summer





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There's a FLUPACO Pump for every condition. For example, the FLUPACO Groove Seal "Producer," illustrated at left, is an insert pump offering the greatest economy in pumping stripper wells and wells of medium depth and volume. It provides the largest possible cross-sectional displacement area in this type of pump and is unusually simple in construction—which means *low maintenance costs.*

Another popular FLUPACO Pump is the "Volume Producer" which is made in longer lengths for best pumping conditions in large volume and deep wells, as well as in wells of normal volume and depth.

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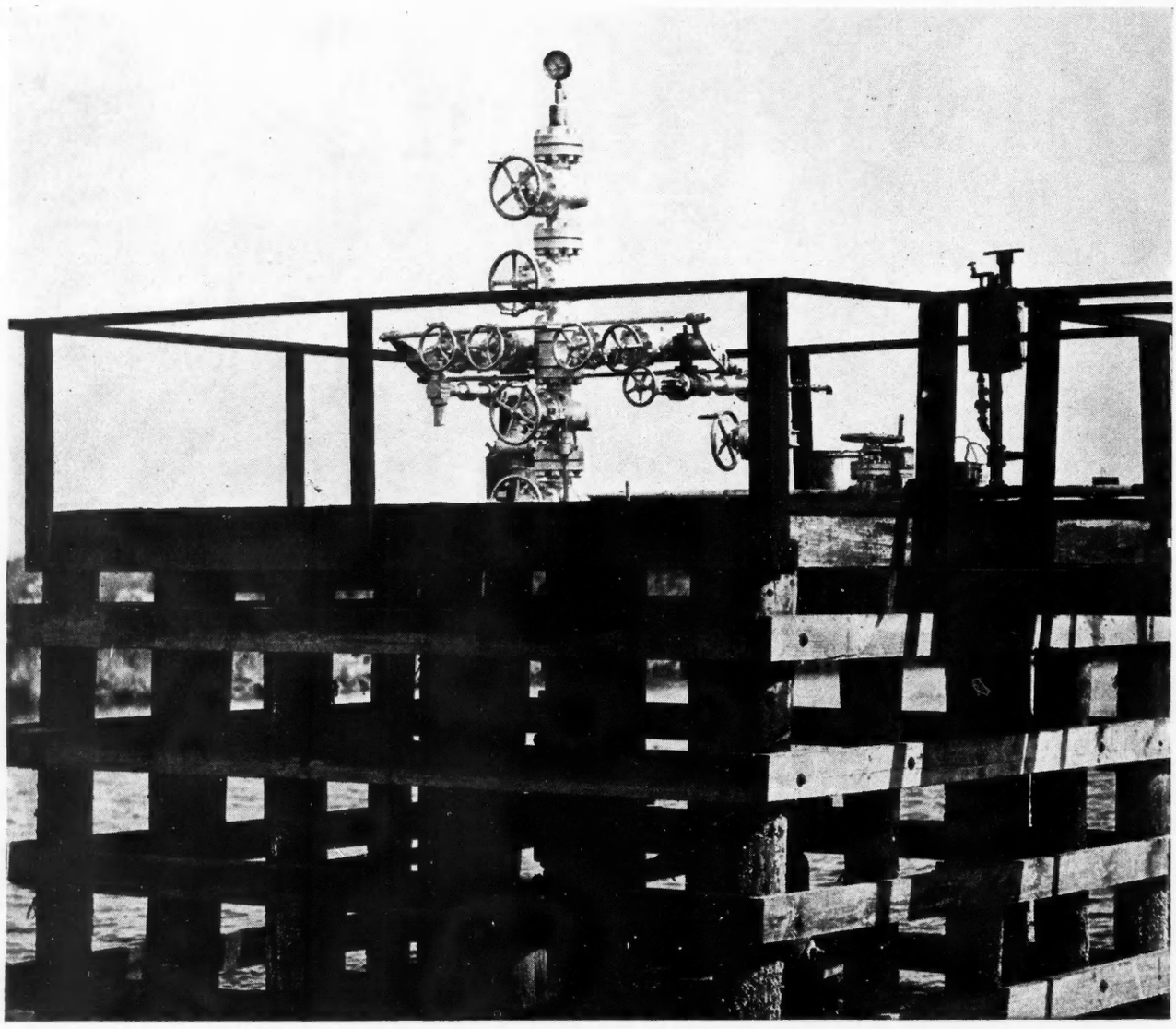

Completion practices in the Lafitte, Louisiana, field include the use of high-test Christmas trees, such as the one shown here. The main tree section is connected to a 30-foot joint of 3-inch Grade D drill pipe. Piling assists in protecting the assembly on water locations.

Company in this territory are significant, as 10,000-foot drilling and completion has become routine with the firm. This company has a good percentage of all the 10,000-foot producing wells in the world.

Bottom-hole equipment for this company's deep wells completed with screen generally consists of a set shoe, to which tubing is connected, screen, liner and liner packer. This assembly is run into the well on the tubing, which passes through liner and screen to connect to a positive-closing valve in the set shoe. The tubing-set shoe connection is equipped with ball bearings to reduce friction due to uncertain tubing loads when the screen is on bottom, and while the tubing is being turned to release from the screen and close the set shoe. The release from the set shoe is indicated bv pump pressure. The tubing is raised to permit expanding compression dogs to expand above the top of the liner packer. Then the tubing is lowered to compress the liner packer, after which it is raised and lowered several times to be sure the packer is compressed tightly.

Combination slip suspension and welded types of casing hanger provided with an auxiliary stuffing box to give an additional seal to the welding are in use with the above subsurface equipment. These fit in an A.P.I. flanged casing head section. An A.P.I. type soft-steel ring gasket is used for sealing between the top of the casing hanger and the tubing head or upper casing section. By using the ring gasket on the hanger instead of between the flanges, the high well pressure is confined within a small area, making it possible to use 6000-pound test A.P.I. flanges on 10,000-pound test tubing head sections.

Tubing heads permit washing behind the screen and setting the packers under full control. The main Christmas tree section consists of a double-wing tree, using double valving with flanged valves on the vertical stem and screwed valves on the wing. An adjustable choke is on one side of the tree and a positive choke on the other. The main tree section is connected to a 30-foot joint of 3-inch Grade D drill pipe, which has been polished on the outside and has had the upset bored out at each end equal to

New OTIS removable BOTTOM HOLE REGULATOR

All the advantages of the Otis Removable Bottom Hole Choke plus the additional feature of allowing changes in rate of withdrawal. The opening through the Bottom Hole Regulator automatically changes when the size of the surface choke is changed to allow for increase or decrease in rate of flow. Tubing flowing pressures are at all times reduced to a safe workable limit. Freezing at any rate of production is positively eliminated.

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the inside diameter of the tubing, the latter being connected to the drill-pipe section. A special companion flange, with auxiliary stuffing box for sealing in addition to the threads, is provided to connect the joint of drill pipe to the first master valve. Where pressures of 5000 pounds are to be dealt with, flanged connections are employed for the primary joint with the well head.

In the actual washing of the well the tubing is so spaced that when packer is finally set, the master valve will be a few inches above the slips on the tubing head. It is necessary to support the tubing during this stage by connecting the kelly into the top of the first master valve on top of the tree. The upper section of the tree above the first master valve is not finally installed until after the drilling barge, if it is a water location, has been moved off the well. At water sites piling is driven around the well (to protect it from damage) before it is put on production.

An interesting point in connection with this Fausse Point operation was the encountering of bottom-hole temperatures up to 335°.

Old Ocean Practice

In the Old Ocean field of Texas, one of the most productive and highest pressured 10,000-foot pools, a system in use is that of installing screen and liner within a perforated-casing string run to the bottom of the hole. While the setting described here is used primarily in wells produced through perforated oil strings, it has been employed in wells in which screen is set opposite the oil sand also.

The bottom-hole setting, which is run on the tubing, consists of the following items, described in the order of their position from bottom to top: (1) a 10-foot slotted anchor, of same size as the tubing string; (2) sufficient tubing to space joint of screen above the level of the casing perforations; (3) a 30-foot joint of tubing, 20 feet of which is wire wrapped; (4) a safety joint; (5) one or two circulating - type bottom - hole chokes, if desired; (6) a special circulating anchor tubing packer; (7) a second safety joint; and (8) the tubing string to the surface.

The setting may be used with any type tubing suspension and seal head, although at Old Ocean the surface control manifold is equipped with a hanger nipple for suspension of the tubing after the packer has been sealed. This hanger nipple is designed to receive the removable back - pressure valve, and is spaced in the tubing string so it will be opposite the point of suspension after packer has been sealed. When the suspension device carrying the removable back-pressure valve has been made up in the tubing string, a wash joint is installed above the suspension unit. On top of the wash joint a releasable back-pressure valve is installed, above which is made up a drill pup joint containing a strainer. With a stuffing-box preventer installed above the Christmas tree, the well is ready to be washed.

With the bottom-hole assembly in place and the pumps running, the tubing is lowered 18 to 24 inches. Lowering the string seals the packer and stalls the pumps, thus providing a test of the packer efficiency before washing. The tubing string is then picked up two feet or slightly more, and the well washed as the operator may desire.

When clear-water returns are obtained, tubing is lowered until the suspension device is seated and packer sealed. The removable back-pressure valve in the suspension device holds the pressure in the tubing. The seal on the outside of the suspension device holds the annular space pressure. Pressure trapped between the removable back-pressure valve in the suspension device and the releasable back-pressure valve in the wash joint may then be released through standpipe fittings. The wash joint may be broken out and laid down without snubbing. Then the stuffing box preventer may be removed and the back-pressure-valve-removing tool installed above the master gate. After the back-pressure valve is removed from the suspension device and raised above the tubing master valve, the latter is closed. The valve-removing tool is removed next, and the top of the Christmas tree is installed. The well can now clean itself and be turned into the tanks.

Wasco Discovery Procedure

A 4½-inch 2898-foot liner with drillable alloy features and unusual cementing design was run and landed at 14,315 feet in Continental Oil Company's K. C. L. A-2, discovery well in the Wasco, California, field. This is the deepest test ever drilled (15,004 feet), and also became the first successful completion at 13,000 feet when it proved productive at 13,175 feet.

The drillable alloy liner, which was all blank except for two perforated sections at 13,092-13,175 feet and from 14,049-14,315 feet, was hung in the 11,573-foot 7-inch casing string at 11,417 feet. A drillable alloy tubing pack-off collar and tail pipe was used to connect the upper and lower blank sections, each of which were equipped with devices to permit two-stage cementing through ports at 13,996 feet and 13,005 feet, so that production tests could be made of the two zones opposite the perforations.

The lower blank section of pipe included a duplex whirler cementing collar with solid bottom baffle and cementing basket, while the upper blank section had a whirler cementing collar with a metal basket. A drillable alloy tubing pack-off collar and tail pipe was used to connect the upper and lower blank sections.

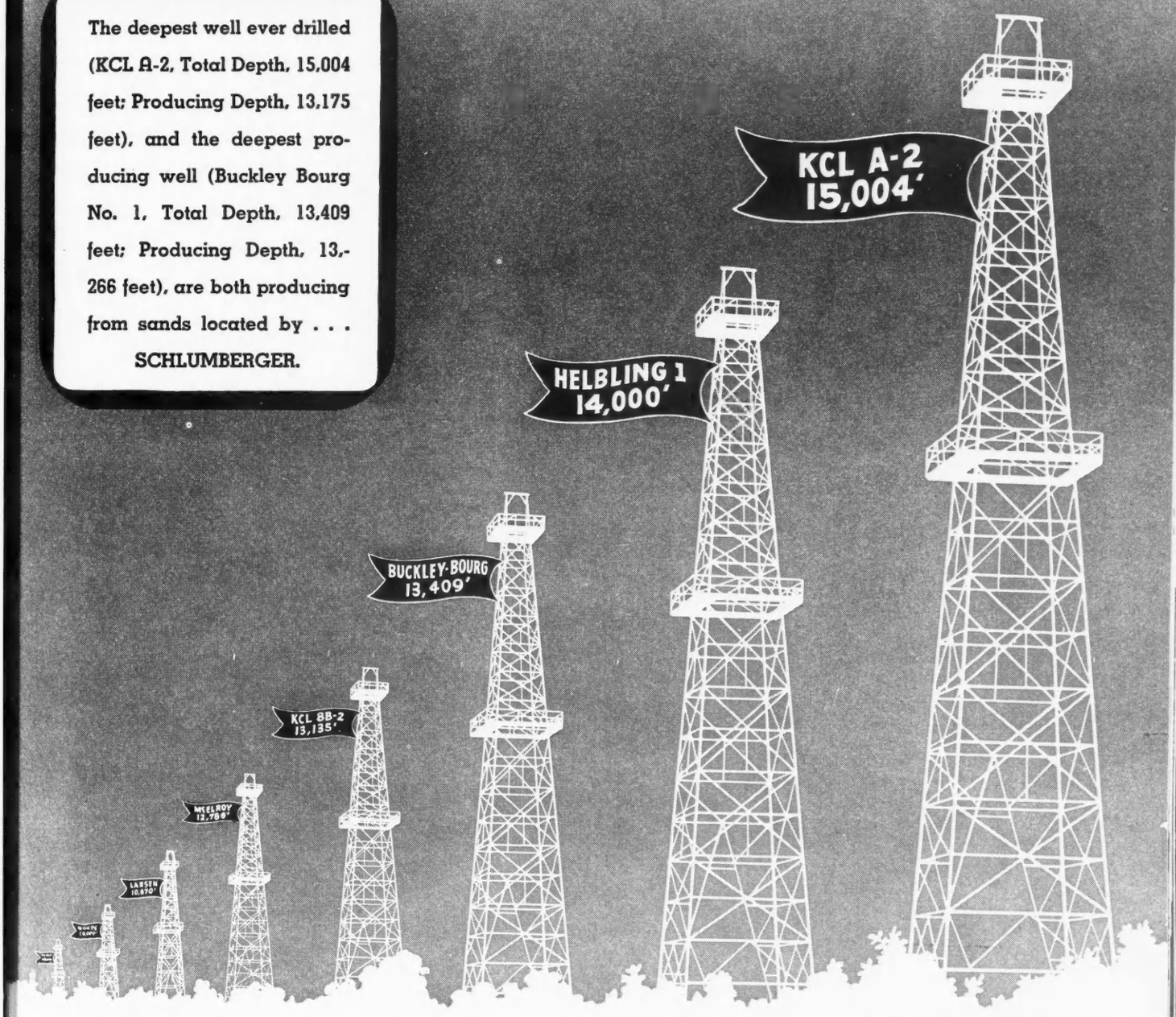
The 2898-foot liner was made up and run in the hole to a point where the tubing pack-off collar was to be placed. The tubing pack-off collar consisted of a drillable alloy bottom blank, a rubber packing ring, and a drillable alloy packing gland at top. The gland was used to tighten the rubber packing and still allow sufficient room for the expansion of the drillable alloy tubing.

After the tubing pack-off collar had been made up, the drillable alloy tubing was run in and screwed into the upper end of the duplex cementing collar on the lower section of pipe. The packing assembly was then placed in position and packed-off. The remainder of the liner was made up and hung on a 'J" type tool, which was provided with a tail pipe having two inverted swab rubbers on the lower end. The tail pipe was of sufficient length to place the swab rubbers below the cementing parts of the upper blank section. The full combination of liner, drillable alloy tubing, cementing accessories, etc., was then run into the hole on 3½-inch external upset, internal flush drill pipe.

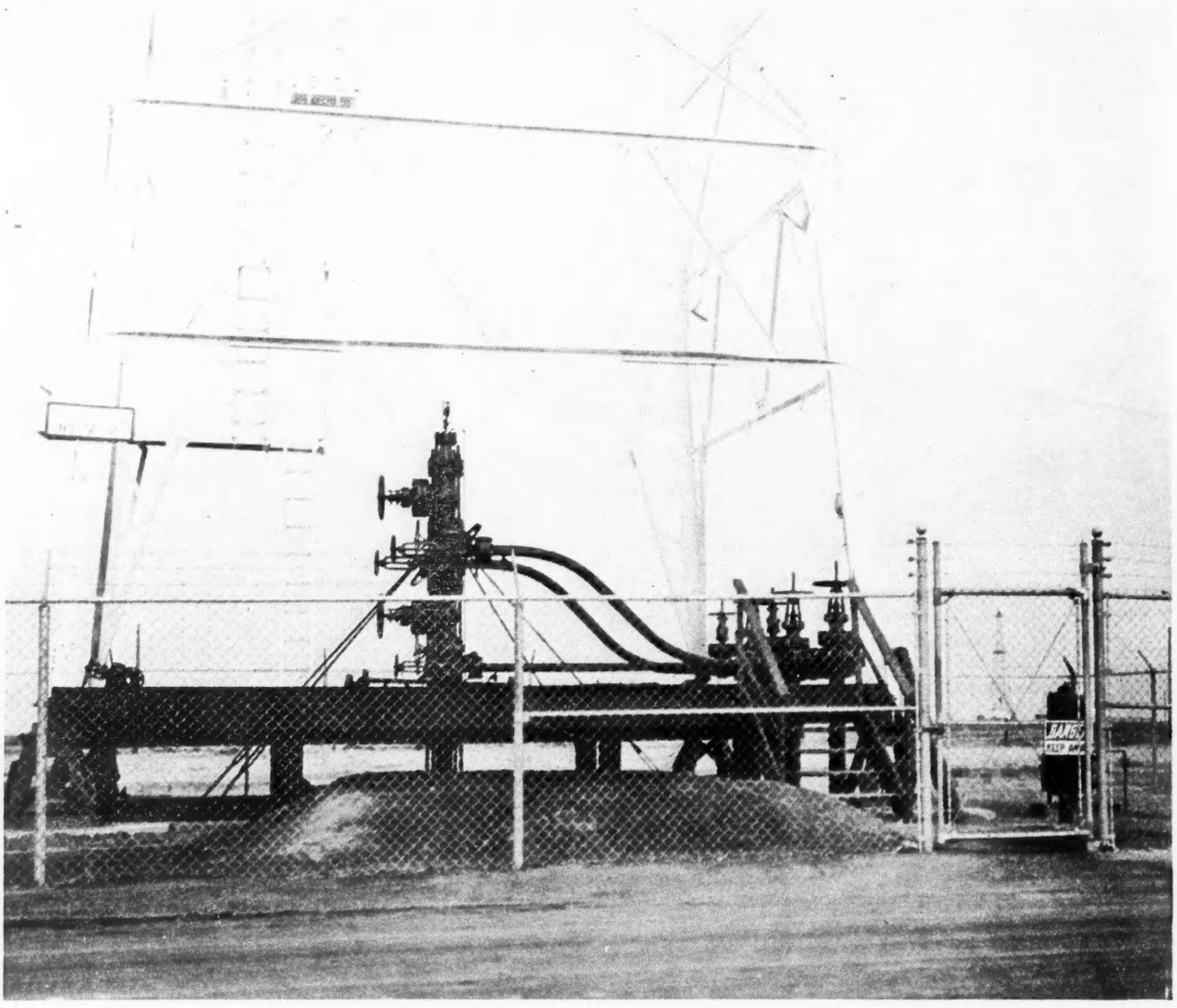
The first or lower-stage cement job was done by pumping 55 sacks of high-temperature cement down through the drill pipe, "J" tool and tail pipe and out through the ports at 13,996 feet. Passage of the cement through ports in the upper

All ELECTRICALLY LOGGED BY SCHLUMBERGER

The deepest well ever drilled (KCL A-2, Total Depth, 15,004 feet; Producing Depth, 13,175 feet), and the deepest producing well (Buckley Bourg No. 1, Total Depth, 13,409 feet; Producing Depth, 13,266 feet), are both producing from sands located by . . . SCHLUMBERGER.



SCHLUMBERGER WELL SURVEYING CORPORATION ★ HOUSTON, TEXAS



A recent picture of Continental Oil Company's KCL A-2, discovery well in the Wasco, California, field. Originally drilled to 15,004 feet, this well was plugged back to produce from around 13,100 feet. A deeper oil zone has not been tested. A complicated liner arrangement was run successfully in this well.

cement collar was prevented by the swab rubbers; and return of the cement up the tubing was prevented by the ball back-pressure valve in the lower cementing collar.

As soon as the cement had been placed the bridging ball was dropped down the drill pipe and seated on the pack-off collar. The drill pipe then was raised until the swab rubbers were above the ports in the cement collar on the upper blank section. The second or upper-stage cementing job was then done by pumping 130 sacks of high-temperature cement down the drill pipe and through the ports at 13,005 feet. Both cementing jobs required a final pressure of 1950 pounds.

As the upper horizon at 13,092-13,175 feet was tested first and proved a good producing zone, the lower section has not been drilled out and will remain cemented unless it is decided to make tests for production through the lower perforated section at a later date.

Rio Bravo Completions

In the Rio Bravo field of California, where 31 wells are producing from 11,200 to 11,500 feet, the usual practice is to set a string of 7⅝-inch casing. The next operation is the landing of screen and liner, ordinarily a perforated drillable alloy 5-inch assembly, which varies in length according to the thickness of the producing formation. The usual liner lengths are from 150 to 300 feet, with the amount of sand opened for production ranging from 134 to 250 feet. After 2½-inch tubing is set, operators circulate mud fluid out of the hole with water (sometimes oil) to lighten the load and bring in the well. From the time that the 7⅝-inch casing is landed, the average well at Rio Bravo is placed on production within 3 to 5 days.

There are many other phases in connection with the "Completion of Deep Wells" that have not been mentioned, but when the progress of the past few years is realized, particularly when proper value is placed upon the additional knowledge the industry has obtained on the problems and characteristics encountered in deep formations, it may be stated that the equipment manufacturers and production company engineers will be able to keep up with forward marches of procuring production at much deeper levels than at present.

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THE *Greater* THE NEED
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THERE IS NOTHING EQUAL TO SEAMLESS

Safety Problems Increase With Deeper Drilling

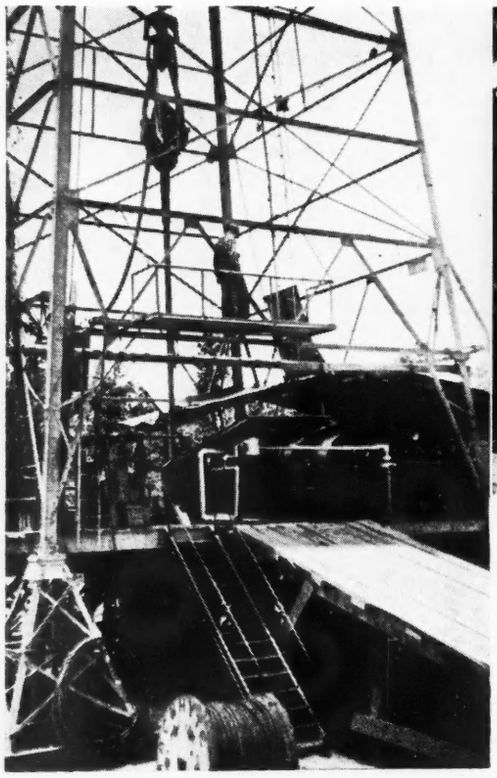
By C. L. HIGHTOWER,
Safety Director, Union Producing Company

A STUDY of the accident records of the drilling branch of the petroleum industry reveals two significant safety facts: (1) accidents occur with much greater frequency than in other departments and (2) injuries are more serious.

With the present trend of the industry toward drilling to deeper depths, both of the above factors become more pronounced and therefore many new safety problems have been added. Drilling to greater depths develops additional hazards through the encountering of higher pressures and increased temperatures, which accentuate the problem of blowout control. The use of larger and heavier equipment likewise is an important influence. Deep drilling has made necessary the use of taller, stronger derricks; heavier, larger blocks, hooks and lines; larger power plants, pumps and auxiliary equipment. When a derrickman is involved in a fall, he is naturally subject to greater possibilities of a serious injury when working on a taller derrick. The larger blocks, at least in many instances, have reduced his working space due to its lessened clearance between the sides of the derrick. The weight of the drill pipe in a hole two miles or more in depth is tremendous, and the additional number of joints to be handled increase the possibility of injury during stabbing operations.

The A. P. I. Summary of Injuries Report for 1938 shows that there was one disabling injury for every 10 workers in drilling operations as compared to the combined record for all departments of but one injury to 38 workers, making the drilling accident frequency almost four times as high as the combined rate for all departments.

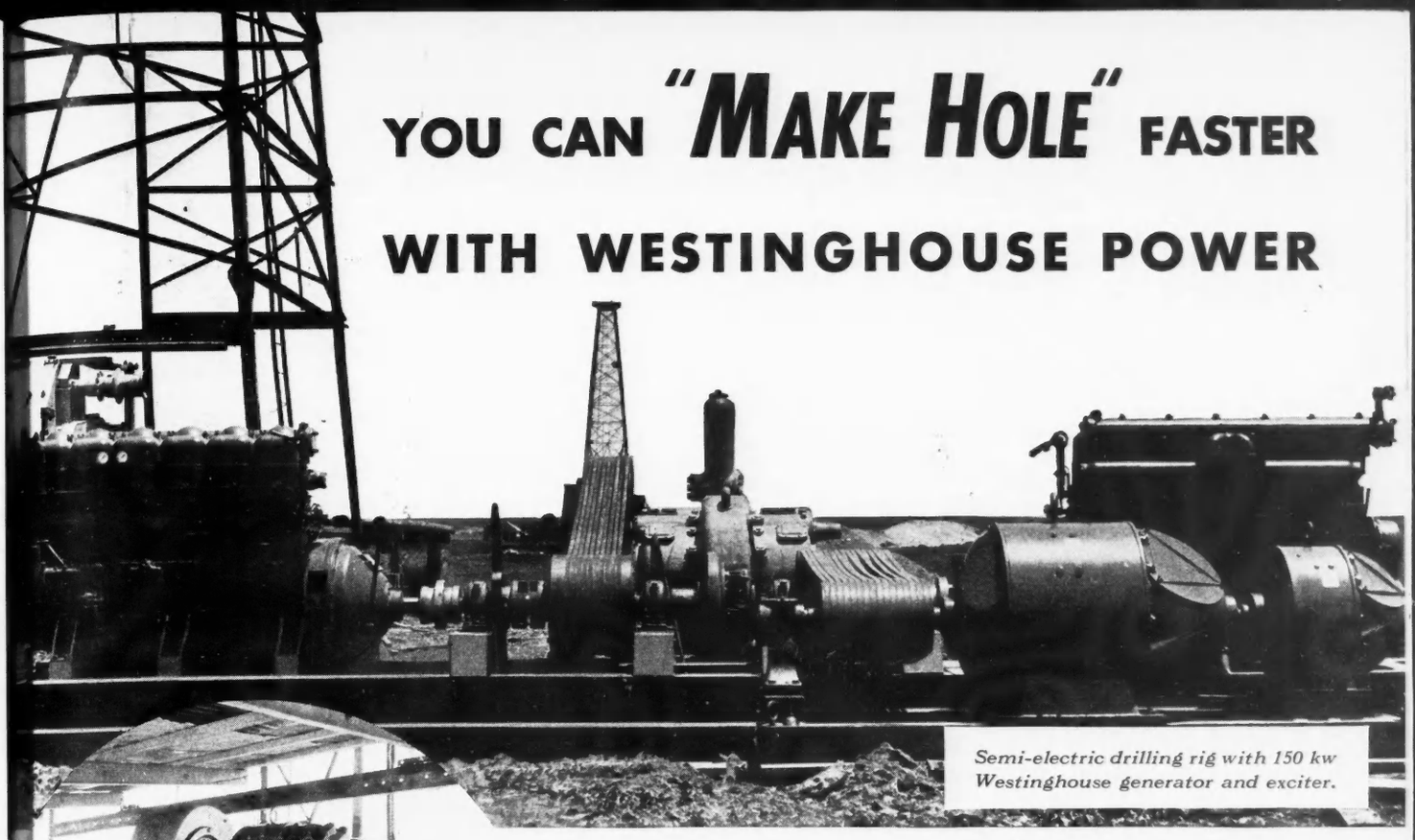
The seriousness of drilling acci-



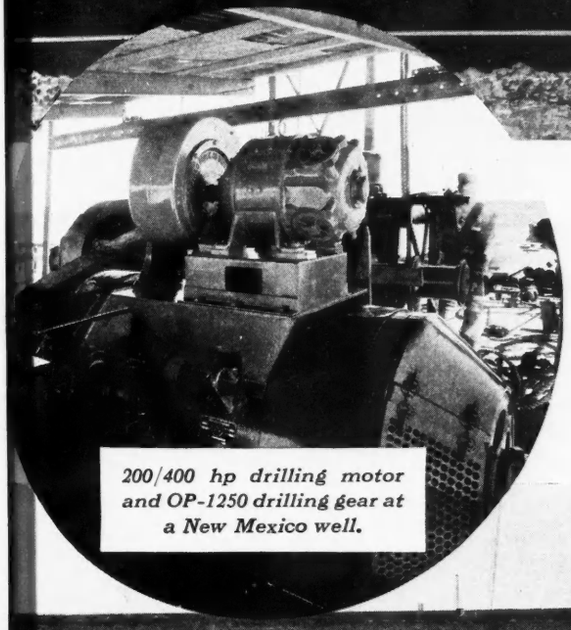
Railings around derrick platforms and on all ladders and walkways, as shown above, are essential to safety in drilling operations.

A landing platform where the derrick ladder offsets, as shown to the left, will prevent many accidental falls.

YOU CAN "MAKE HOLE" FASTER WITH WESTINGHOUSE POWER



Semi-electric drilling rig with 150 kw Westinghouse generator and exciter.



200/400 hp drilling motor and OP-1250 drilling gear at a New Mexico well.

Two 200 hp d-c mud pump motors with blowers.

Putting electricity to work on your drilling operations brings many important advantages. You obtain more flexible and smooth speed and torque control for the various drilling and hoisting operations. Torques up to 200% full load are available. And all of these benefits are multiplied when you use Westinghouse equipment.

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Our representatives in every oil field are at your service. They are experienced in the petroleum industry — and they have "back-up" support from headquarters when needed. Ask them what electricity can do for you. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

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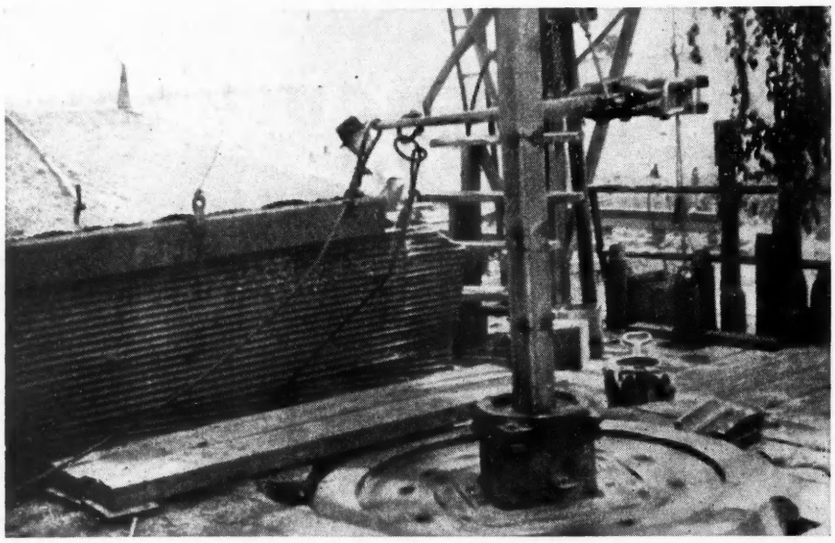


The use of wire rope as safety lines is a simple but vital precaution. Failure to do so has resulted in many serious accidents.

dents is reflected by the severity rate. For the year 1938, drilling employees averaged 4.44 lost time days for every thousand hours worked, while the all department average was only 1.59 days.

It is appreciated, of course, that drilling operations offer varied and unusual hazards, and that the work is more comparable to construction than to the routine operations in connection with pipe line, production or refining. However, it is encouraging to note that progress is being made from year to year in controlling drilling accidents, despite the deeper drilling trend with its attendant increase in hazards and new problems. Over the five year period from 1934 to 1938, frequency of drilling accidents were reduced from 69.0 to 49.5. It is none the less evident that the rate is still too high, and that there remains much to be done in order to bring it into line with that of other departments of the industry.

The accident prevention problems of deep drilling are both unusual and varied, but manufacturers are keeping abreast of the times by building better and safer equipment. It is the job of the drilling concerns to improve their methods and plan their work so that organization failure and accidents will not result.

These fundamental principles are essential to the success of safety work on any job:

1. A belief on the part of the management, executives and supervisors that accidents are unnecessary and that they can be controlled.

2. Active participation in the safety program by executives and supervisors who must set the example for the rank and file.

3. A definite program of job and safety training to improve the knowledge of the worker and interest him in the objectives of accident prevention.

Based on the above fundamentals any safety program will enjoy some measure of success. Without them, any program will fail.

The tongs shown above have been equipped with a safety line to limit arc of swing in event pull line breaks, thereby lessening the dangers of a workman being struck.

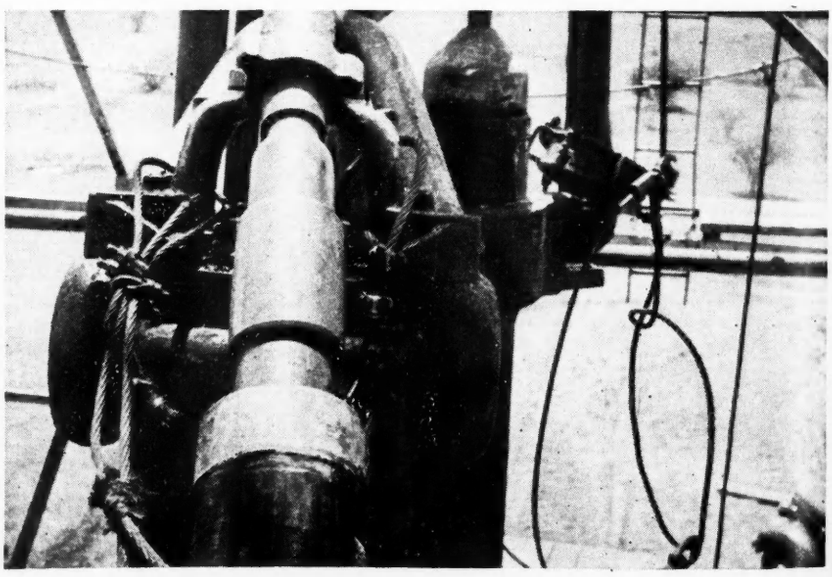
Rigging Up Operations

Safety must start with the moving in of material and equipment to location and the rigging up. Unitization of equipment has not only shortened the time required for moving in and setting up, but it also has contributed materially to the safety of these operations. However, many hazards still exist.

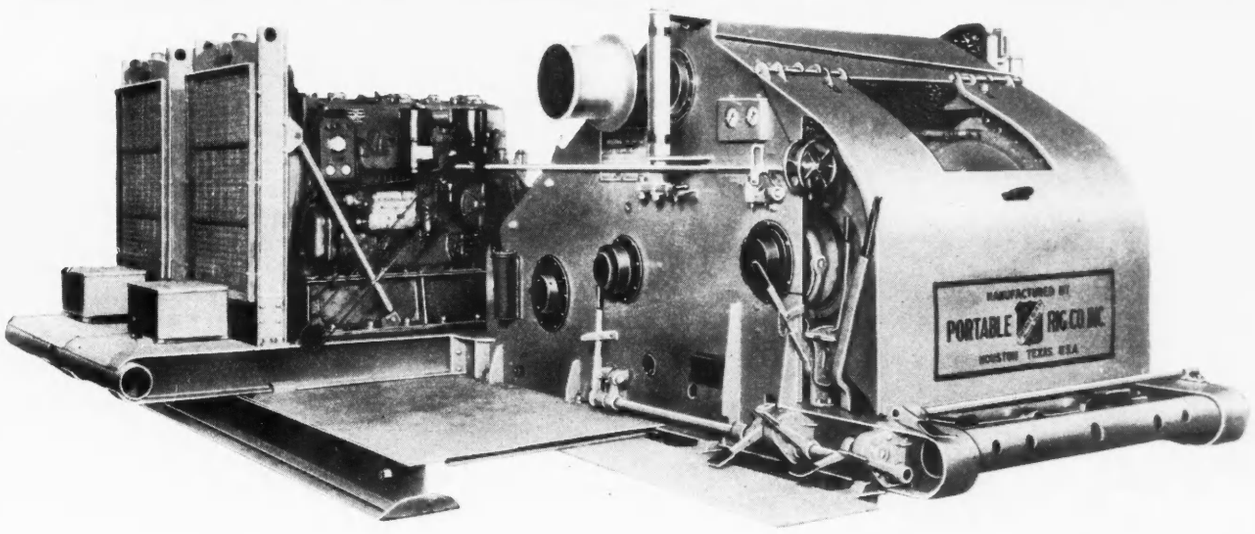
Undue haste continues as a major factor in the cause of drilling accidents. This is particularly evident in the process of "rigging up." Often this work is done under rush conditions because of drilling commitments under lease agreements, or because of the failure of the administrative departments to notify the operating department in sufficient time so that rigging up can be done in an orderly manner and drilling operations started before the "dead line" date. Whatever the cause, a burden is thrown on the drilling department personnel and planned procedure is sacrificed in an effort to conserve time.

The practice of drilling crews racing against time in an effort to reach the sand first is passing rapidly. Speed is still employed in making hole, as time continues an

Snubbing the mud hose to the swivel with a safety wire line, as shown below, prevents the hose falling to the floor should a connection break.



Sure . . . there's a
PORTABLE RIG
For Deep Drilling!



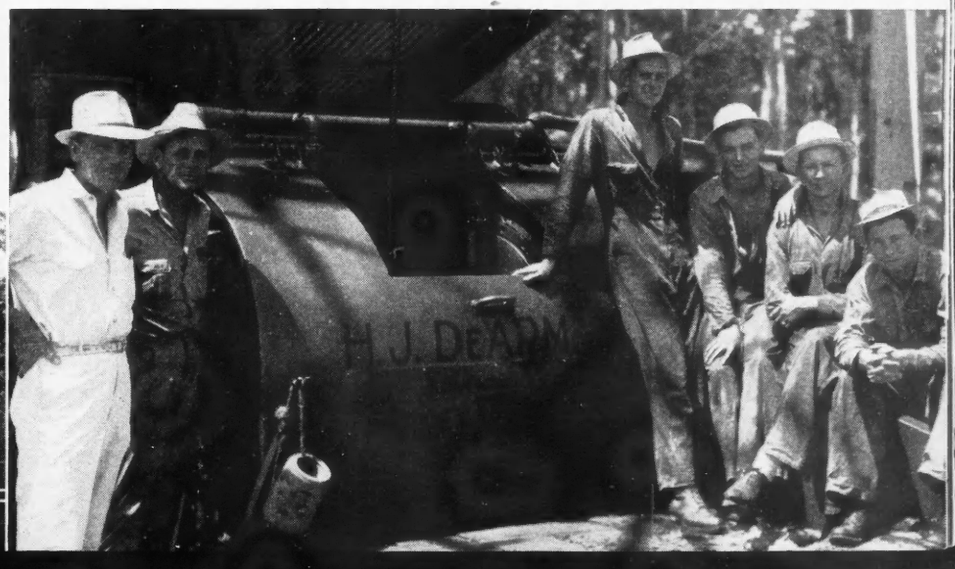
Here's one that just completed a 10,720-foot hole for H. J. DeArman, Drilling Contractor, in the Charenton field, St. Mary Parish, Louisiana. Other Portable Rigs have figured in the drilling of a large number of notably deep wells in the Texas-Louisiana Coastal area.

Operators planning a deep test are invited to investigate the heavy-duty Portable Rigs. Extreme portability, speed, economy and advanced design . . . features which have established the lighter Portable Rigs as leaders in the field . . . have also been built into these heavier rigs for today's deep drilling.

LEFT: H. J. DeArman, Drilling Contractor, whose Portable Rig recently completed a 10,720' hole in Coastal Louisiana.

LOWER LEFT: View of the H. J. DeArman rig in the Charenton, Louisiana, field.

LOWER RIGHT: Drilling crew, reading left to right: T. H. Jackson, Supt.; C. B. Webster, Driller; P. T. Webster, T. H. Jackson, Jr., Boyd Lacey, and L. M. Jones.



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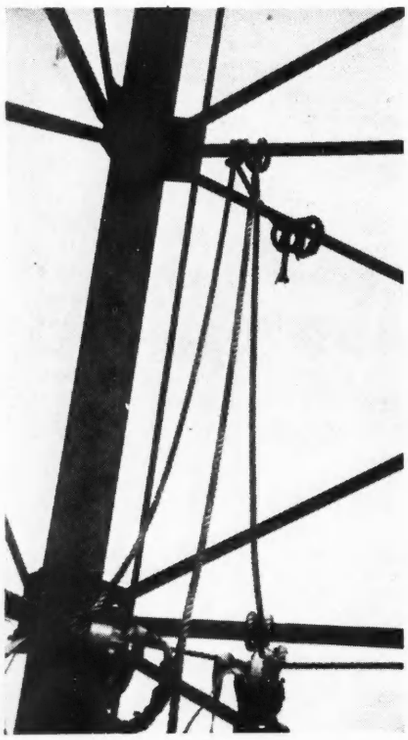
important factor in drilling operations; but it is planned speed rather than haphazard haste. Experience has proved that the extra wear and tear on equipment and job interruptions that result from breakdowns and accidents more than offsets any time saved through chance taking and rush work. Time spent in setting up the derrick correctly and properly installing and guarding equipment is obviously time saved. The former practice of erecting the derrick and rigging up with just enough equipment to start making hole, leaving the cleaning up and installation of protective guards until shut down time while waiting for cement to set on surface casing, has been responsible for many accidents.

The premises must be cleaned up and mechanical guards installed in order to prevent such routine accidents as men stepping on nails, stumbling over loose objects and entanglements with moving machinery.

The following accidents serve to emphasize some of the more pronounced hazards in connection with rigging up operations:

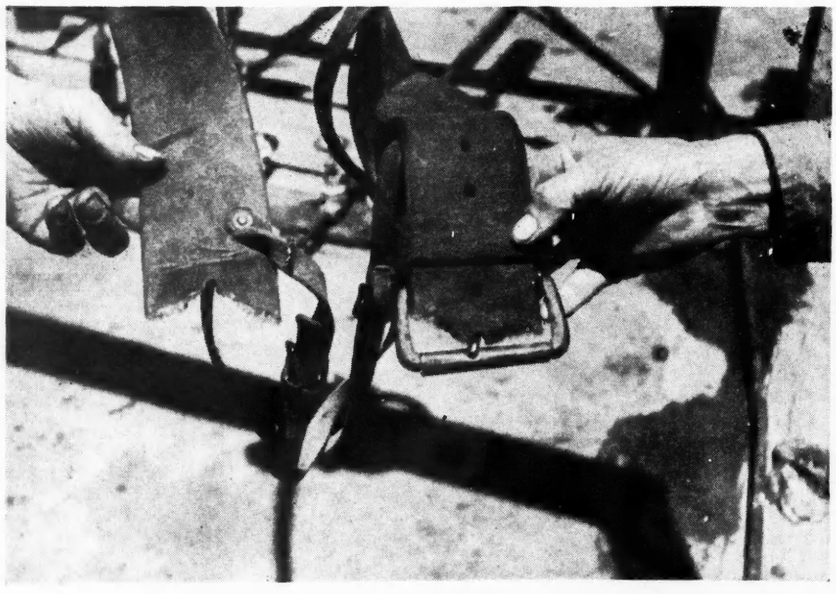
Two drilling crews were rigging up. A boiler stack was being raised by use of a truck winch and an A frame to put in place on the end boiler of a 3-boiler battery. Stacks had already been raised and guy lines attached on the other boilers. Due to the fact that boilers were set on sloping ground, the truck could not raise stack high enough to get it in place and it was necessary to block up under the truck wheels. After boards were placed, the truck was moved forward several feet and then reversed at a rapid speed so as to mount the boards. The stack which was suspended from the A frame with a chain fastened near the center, swung around as the truck wheels kicked up on the boards, and struck a guy wire for the stack on the middle boiler. This stack fell, knocking the stack off the third boiler which in turn fell to the ground striking a workman who was in the act of repairing the boiler. The injuries suffered by this employee resulted fatally.



Too many fatal accidents have made it practically unnecessary to have to caution a derrickman about wearing his safety belt, but other precautions also should be taken.

By tying the safety belt tail line two girths above the thribble board and near the derrick leg, as shown to left, the tail line is held away from the traveling block and consequently the danger of being fouled is eliminated.

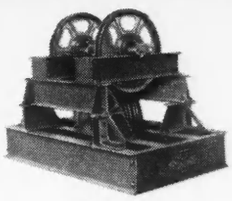
Safety belts should be inspected and tested at regular intervals, and be discarded when they show any signs of weakness or undue wear. The belt shown below broke under only a 200-pound 5-foot drop during an inspection test.



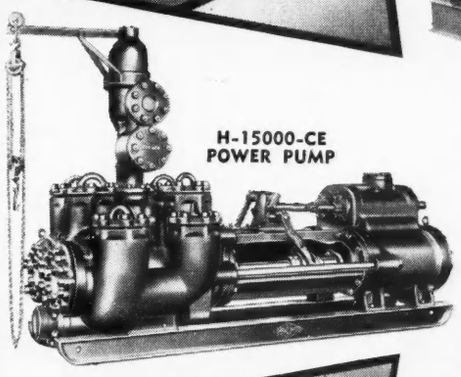
Two derrickmen were sent up in a derrick to construct thribble board during course of rigging up by two drilling crews. Lumber was hauled up with catline and put in place. Afterward, they decided one of the boards must be moved, as the drilling line was not pulling straight. In attempting to move it, the 3 x 10 board slipped out of the hands of one man and the other could not hold it. It fell to the floor, striking and killing two floor men.

In both of these accidents one of the cardinal principles of safety for any industry was violated; namely, that of standing or working under overhead loads. Other factors contributed to the accidents, but the observance of that one simple safety precaution, staying clear of overhead loads, would have saved the lives of three men.

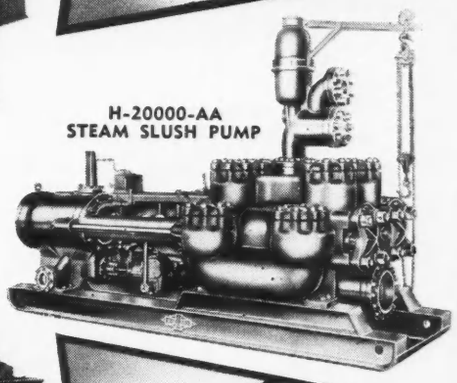
The improper location of boilers has caused many accidents. They should always be set to the windward side of the derrick according to the prevailing winds for the area, so that any escaping gas from the well, will be blown away from the boilers. Boilers should not be installed with either end pointing towards the derrick as the boiler is usually propelled backwards or forwards when it explodes or "blows up" and very seldom sideways. The distance of the boilers from the derrick should be governed by local laws and conditions, and never within a distance of 150 feet.



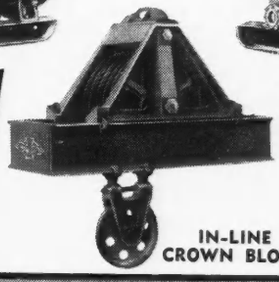
J-7000-B
DOUBLE-DECK
CROWN BLOCK



H-15000-CE
POWER PUMP

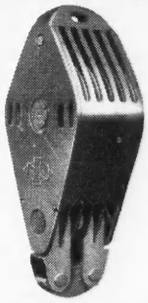


H-20000-AA
STEAM SLUSH PUMP



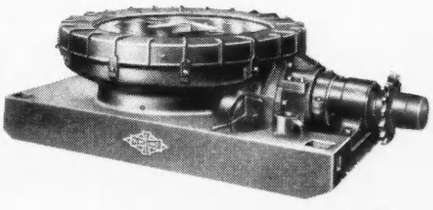
IN-LINE
CROWN BLOCK

WHELAND

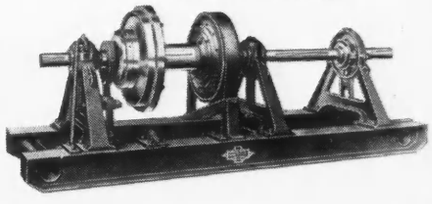


STREAMLINE
TRAVELING BLOCK

A-18000-A
OIL BATH ROTARY



B-7000
REVERSE CLUTCH



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ROTARY DRILLING EQUIPMENT

Chattanooga, Tenn.

"Hard boiled" hats are standard equipment with every safety-minded drilling crew. They have saved many lives in the oil industry.

Fuel feed controls, fuel storage tanks, and other flammable or volatile-liquid containers should be placed away from the fire box opening and out of line with any possible flare-backs. "Dog houses," change houses, or other places where crews congregate, should never be located in front or back of boilers. Beyond these general suggestions, A.P.I.-A.S.M.E. codes must be followed in installation and operation of boilers to insure maximum safety.

The same care must be given to the installation of derrick equipment. The opening for the rotary table should be closed before the first material for rigging up is moved to the derrick floor, and should remain closed until the rotary table is ready to be placed. Many accidents have occurred from employees stepping or falling into opening and also from dropping tools and materials on men working in the cellar.

The following practices should be observed in placing equipment on the rig:

1. The space between the drum and rotary should be floored to the level of the rotary table. The flooring should conform to the curve of the table and extent over the shaft bearing between the drive chain sprocket and table.

2. Valves on steam lines should be painted red to distinguish them from water lines.

3. The crown block should be loaded by the daylight crew. Multiple lines should be used to avoid overloading of gin pole.

4. Gudgeon caps should be kept securely in place so that sheaves cannot jump out of the bearings and fall to the derrick floor.

5. The traveling block should be strung on the floor of the derrick so as to avoid the danger of the block being dropped.

6. The dead line, if possible, should be strung next to the fourble board and the fast line should be away from the fourble board.

7. The drilling line should be dead-ended to the base of the derrick directly opposite the drawworks. This serves to distribute the weight on the traveling block to the four legs of the derrick.

8. Care must be observed to make sure that "U" bolts or other anchorages are properly set in good concrete.

9. The finger board should be attached to the derrick with an auxiliary line of light cable to prevent its falling, should the hook or traveling block hit it and break it loose.

10. The weight indicator should be placed within full vision of the driller and tied back to a derrick brace so that it will not be thrown across the floor when a sudden shock is placed on the drilling line.

11. Break-out and back-up tongs should be equipped with safety line to limit the arc of the swing.

12. Counterbalance weights rigged to hang in the corner of the derrick, should be close to the derrick leg and close enough to the floor, so that the weight cannot fall on anyone if the supporting line breaks.

13. Chain hoists and snatch blocks should not be fastened to girts. Such handling bends girts and weakens the derrick.

14. Safety lines of chain or wire rope should be installed at each end of the rotary hose to keep the hose from falling or whipping in case a connection should fail. The hose end which is attached to the goose-neck should be snubbed to the swivel.

15. All mud guns should be anchored and the dead end should be snubbed. In the event the gun should break at some point or get out of control, this would prevent its swinging in a complete circle.

These accepted practices are based on past accident experience and the need for their observance is forcibly emphasized from time to time as accidents occur due to failure to follow them. There are, of course, many other precautions to be observed in "rigging up" and the above list includes only the major items.

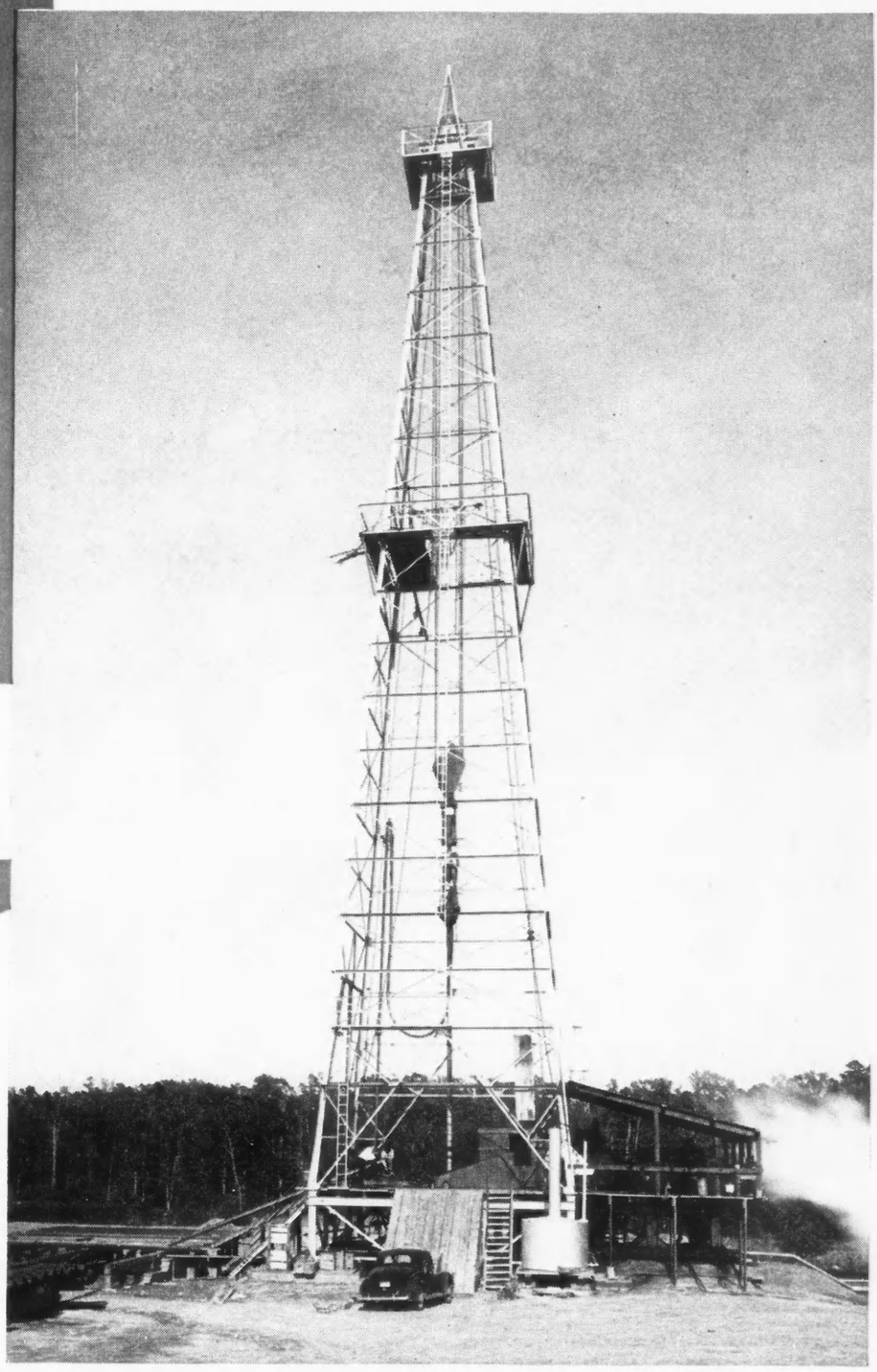
Running Pipe

The pulling in, making up, breaking out and racking of pipe constitutes a major portion of the work on a rig floor and accounts for a large percent of the accidents.

A definite schedule for the inspection and care of crown blocks, sheaves, traveling block, hooks, elevators and lines will eliminate most mechanical failures in connection with handling pipe. It is most convenient for the morning tour crew to make this routine check up, but this does not relieve

M. I. W.

STEEL DERRICK



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the responsibility that rests on the other crews for seeing that equipment is in a safe and usable condition.

Pipe must be racked properly to facilitate its safe movement into the rig. Racks should be of such capacity that it will not be necessary to stack 6-inch drill pipe more than 3 tiers high, nor 4-inch drill pipe more than four tiers high. Joints should be placed straight on the rack and not overlapped.

Joints of pipe should be pulled into the derrick one at a time and not in bundles. The joint to be used should be rolled from the rack to a position directly in front of the derrick "V," and catline attached by use of an endless rope string, fastening the catline hook to the sling. Workmen should always stay from under the pipe. Walkways and rig floor should be kept clear of obstructions so that the wheels of the pipe buggy cannot strike objects that may cause the buggy handle to "buck up" and strike the worker in the abdomen or in the head. The proper application of the elevators to see that they are latched and at the right position is essential.

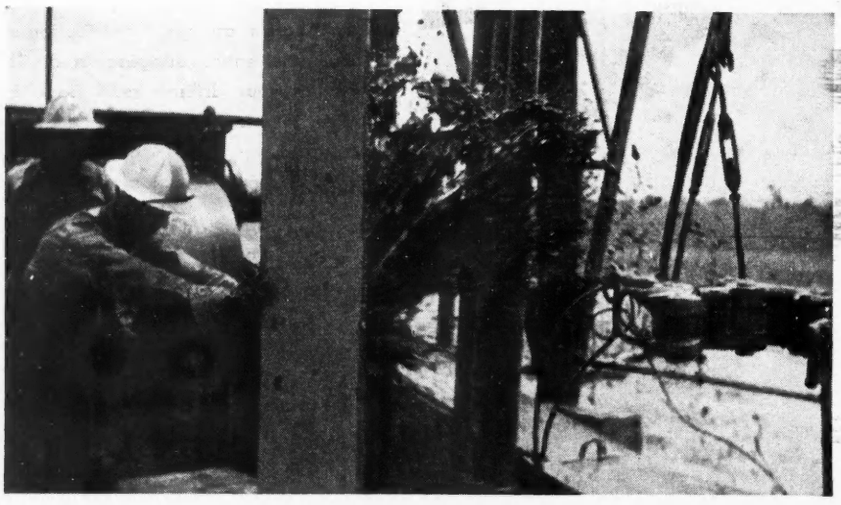
Special elevators are required for handling streamline or flush joint casing. Failure to do this resulted in a fatal injury on one occasion:

Crew was engaged in running streamline casing and was using wire rope as a "pick-up" line. Rope was stiff and would not pull taut against the pipe. As casing was raised to a vertical position through the "V," the "pick-up" line slipped on the pipe, allowing the joint of casing to fall. Deceased, who was standing by the rotary table, was struck on the head and sustained a fractured skull and broken neck.

Many fingers have been lost in stabbing pipe. To set a joint of pipe onto the rotary string, the hands should grip the pipe above the collar so that the fingers will not be caught between the joint and the string in the hole.

Close coordination between all members of the drilling crew is essential to uninterrupted operations in going in the hole. The driller must not only watch his engine and equipment but he also must keep in mind the position of the other men on the derrick. Failure of such coordination is evident in the following accident:

Crew was lowering drill pipe into hole in thribbles. The derrickman latched the elevators on the stand of pipe and while still in a position on the "hay rake" reached over to kick out another stand. As he did so, he turned slightly to the side just as the block passed on the downward trip, the driller hav-



Mud on the derrick floor makes a slippery surface that is dangerous. The enclosed type mud box is preferable to the one shown at left above.

Mud must be tested frequently for weight, viscosity and cake filtration to protect against a blowout and to facilitate proper circulation.

Specify
KINZBACH-AJAX ROTARY SLIPS
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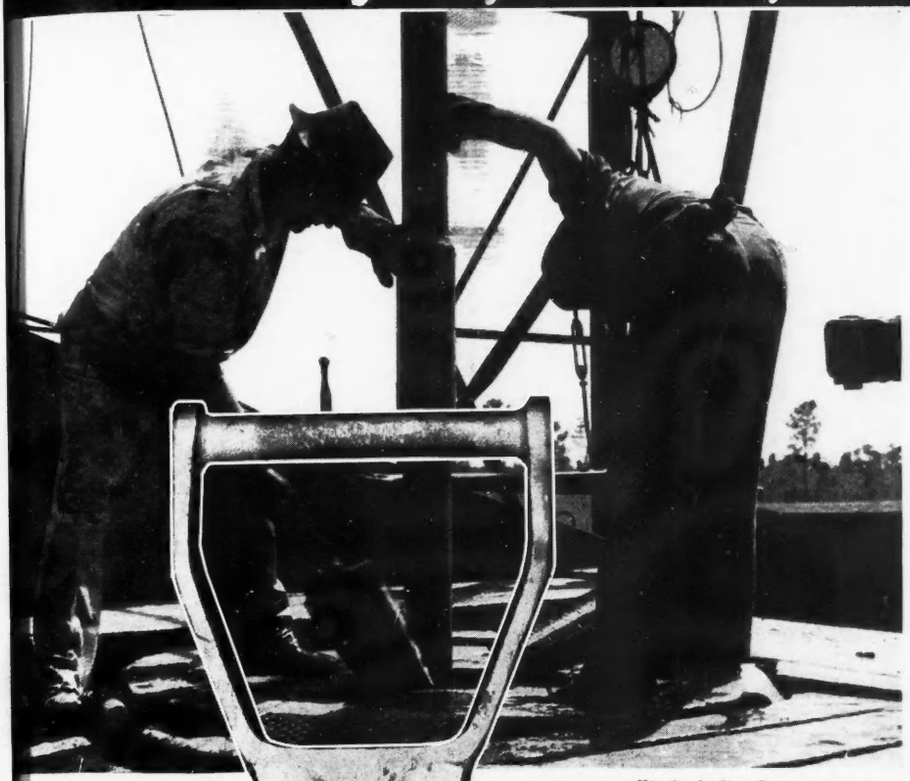
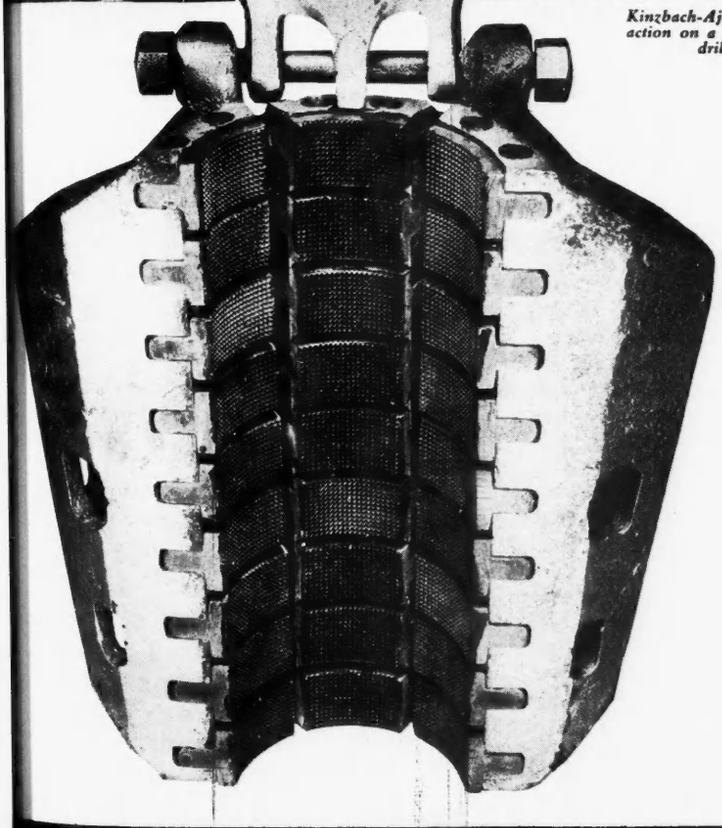


Kinzbach-Ajax Rotary Slips in action on a 10,500' Louisiana drilling job.



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This popular rotary slip has that greater strength necessary to meet today's deep drilling requirements. The design of the broad faced inserts insures a cushioning effect which protects your pipe against damage. Three segments to the half give you greater flexibility and a closer pipe fit. There's an even distribution of load over the entire gripping area. This slip drains your drilling mud back into the hole . . . not on the derrick floor. It is easily serviced right on the job . . . instead of the shop. It cuts your slip cost because, by changing inserts, **several pipe sizes are handled with a single set of segments.**

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They give you everything for your tubing jobs that Kinzbach-Ajax Rotary Slips do on your drill pipe and casing. The result: Quick world-wide acceptance, especially for deep wells. Buy the 2" size, change to larger inserts, and you have a 2½" size . . . or vice versa. It's a saving you should not overlook.

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ing reversed his engine and started in the hole. The safety latch on the hook, where the elevators are fastened, fouled the tail line on the derrickman's belt, pulling him off the thribble board and breaking the safety belt line. The man fell some 70 feet to the derrick floor, suffering fatal injuries.

A check-up with other crews following this accident revealed that in all cases the derrickman was following the practice of "kicking out" the next string of pipe while the blocks were in motion. This was corrected by having the driller hold the blocks at the top position until the derrickman kicked out the next stand of pipe and stepped back on the thribble board in the clear. Also, the tail line was tied two girths above the working platform and towards the corner of the derrick opposite that from where the pipe is stacked instead of straight back to the girth at the working level.

Racing the engine to make speed is detrimental to the machinery as well as being dangerous. There is a limit to the speed that drums will stand before they blow up. Also, to facilitate the application and latching of the elevators and to avoid the pipe being picked up with a sudden jerk, it is essential that the engine be slowed down as the block nears the top of the stand of pipe. If a stand of pipe is picked up too suddenly or with a violent jerk it causes the pipe to whip and makes its control by the floor man very difficult.

Spinning lines also have taken their toll in broken hands and arms. If a spinning line is used the driller should see that the line is in position on the pipe so that it cannot foul and injure the man handling the end of the line. Spinning lines should have a swivel joint in them to prevent kinking or twisting.

Where pipe is stuck in the hole and a heavy pull seems necessary, the driller should keep every one else off the derrick floor even though a pull in excess of the strength of the derrick and equipment is not anticipated. In this way unnecessary exposure of other members of the crew to the hazards of a broken line or falling crown block is avoided.

Pipe should be broken out with the use of "break-out" and "back-up" tongs and not by use of the rotary power.

Racking of pipe in the derrick is important from the standpoint of the weight of pipe and propable strain on derrick. Failure to take these facts into consideration and unexpected high winds has been responsible for the occasional wrecking of derricks.

Catheads and catlines are the source of many accidents. These precautions should be observed in their use:

1. Keep cathead well keyed on shaft and cover key with a cap held in place with a counter-sunk cap screw.
2. Do not use cathead that is worn or grooved.
3. Use catline only on slow-moving cathead, and, for loads which require no more than six turns of line around cathead to lift.
4. Never use a spliced or frayed catline.
5. Do not stand on coil of rope under the cathead when line is being drawn in or let out.
6. The driller must be on the alert and ready to stop the machinery instantly while cathead and catline are being used.
7. The cathead should always be stopped should the line become kinked or fouled. Never attempt to get kinks out or line unfouled with cathead in motion.
8. When raising boards with the catline, the boards should be tied with a half hitch and a timber hitch.

Other Problems

Oftentimes soil conditions are such that serious cave-ins occur, slowing up drilling operations.

Where silicate of soda or other chemicals are used to prevent the crumbling of the formation, additional precautions must be taken to guard against chemical burns. Goggles should be worn when there is danger of mud solution being sprayed on men. The mud must also be washed off to prevent burns on hands, face or other exposed parts of the body. The same precautions are necessary in connection with acidizing operations.

The higher pressures and temperatures encountered in deep drilling accentuates the problem of "blow-out" control. The first essential is to provide mud of the proper weight, to maintain a consistent viscosity and keep the fluid circulating. The petroleum engineer and the driller, working in close cooperation, can control this by close attention to pressure readings and by making frequent tests of the weight and viscosity of mud.

The blow-out preventer is now standard equipment on drilling rigs. The only requirement, beyond providing a preventer of the size and strength to withstand the maximum anticipated pressure, is to operate the equipment occasionally to see that it is in working order and that workmen are familiar with the procedure to follow in operating it.

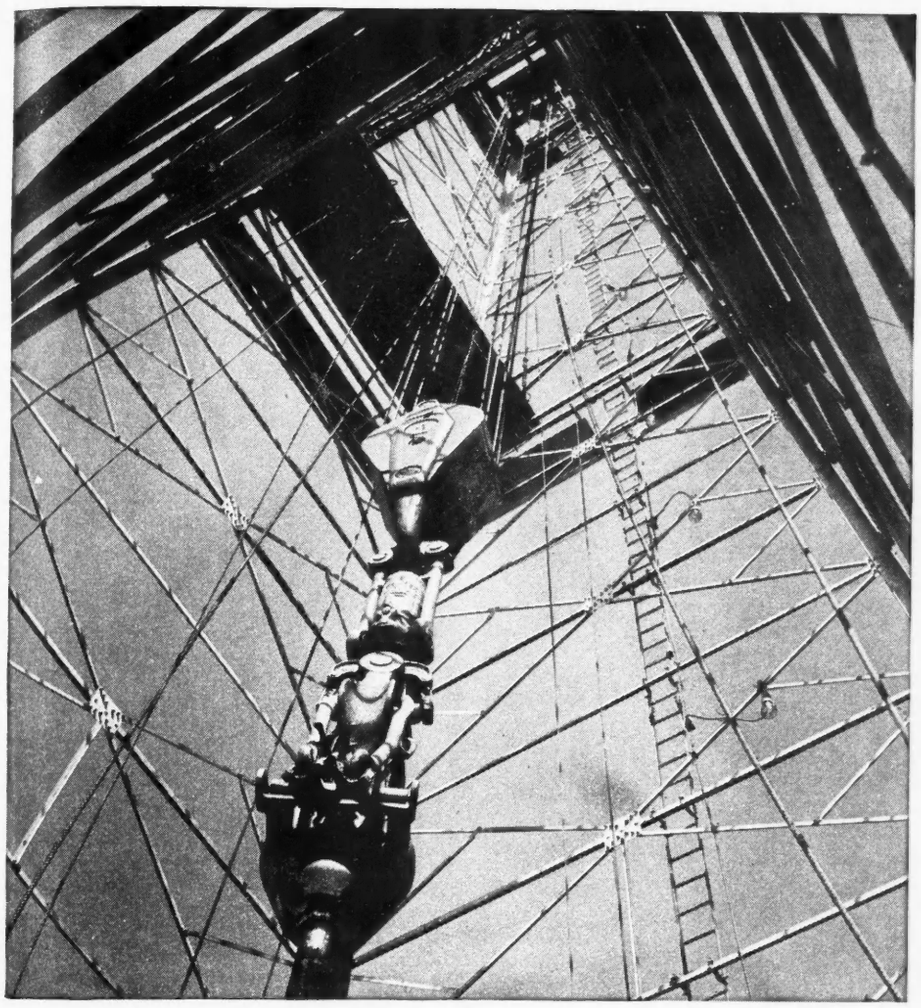
It is seldom necessary now to have to caution a derrickman about wearing his safety belt when working on the thribble or fourble board. Too many fatal accidents have occurred from failure to do so to permit him to forget, but it occasionally happens that men do not wear their belts when they go up to inspect and oil the crown blocks or to check some other part of the derrick. The hazard of falling is greater on these jobs than on the working platform and many companies have provided an extra belt equipped with a short tail line and snap so the worker can anchor to a cross brace or girth when working at an above ground level other than the regular working platform.

The danger of fires and explosions exists wherever there is a possibility of a gas or vapor/air mixture. The drilling rig is no different from the refinery, gasoline plant or pipe line station in this respect. Although we now have accurate geological information and know at what depths to expect oil or gas sands, there is always the possibility of drilling into a stray gas pocket.

The present method of washing in wells has eliminated much of the danger of fire in this operation but gas and oil vapors are released to the atmosphere during the time the well is cleaning itself.

Considering the probability of existing inflammable or explosive mixture under these conditions and also taking into account the seriousness of personal injuries and property damages resulting from fires and explosions, the "no smoking" rule should be rigidly enforced on the derrick floor regardless of the depth of the hole or other conditions.

In reviewing the drilling safety picture we are impressed with the fact that even though the frequency rate is high, the majority of accidents are not due to the inherent hazards of the work, but rather to the same mistakes and failures that are responsible for accidents in other operations.



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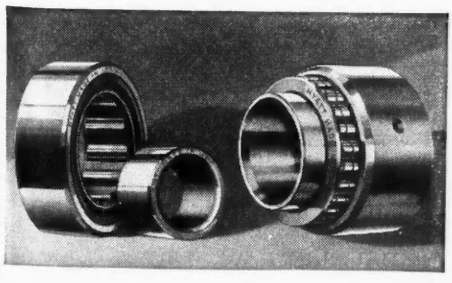

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ROLLER BEARINGS

Vast Advancements in Deep Drilling Equipment Make 18,000-Foot Holes Possible

By WILLIAM H. STRANG, Staff Writer

REMARKABLE advancements in rotary drilling equipment achieved within the past few years indicate drilling of 18,000-foot holes is not far in the future, if the industry becomes desirous of reaching such levels. Drilling rigs are at that stage of perfection now. The current trend in drilling equipment manufacture is toward turning out products capable of functioning effectively and regularly at depths exceeding the previous world's record of 15,004 feet.

At present the tendency is toward equipment of greater size and weight to handle the greater loads and speed requirements and toward unitization of the various groups that constitute a drilling rig.

Costs Reduced

One of the most important contributions of the equipment manufacturer to deep drilling has been the reduction in rig operating costs, achieved largely through refinement of products. Costs rise more rapidly as depth increases, and total investments on some deep holes have been staggering. It has become imperative that equipment must be not only of sufficient capacity to attain great depths, but also of sufficient refinement to do it economically. Now that the novelty of 13,000-foot drilling has passed, practical operators are inquiring closely into the payout situation.

No improvements can be made in one part of the drilling equipment without a corresponding development in all parts. Consequently, since 1935 there have been advancements in all machinery. While some items have been improved and new sizes have been added to others, there have been some innovations also. Oil equipment manufacturing consistently has been characterized by introduction of better metallurgy, more efficient lubricating systems, and wide usage of bearings. Materially advanced drilling control instruments, and numerous "insurance" devices for prolonging life and detecting defects have made their advent.

To date the largest rig assembled in the field has consisted of five 500-pound, 130-horsepower boilers, 15x14 inch steam engine driving a 48,220-pound, 3-speed drawworks with 40-inch double rotor hydromatic brake, a 20½-inch, 350 r.p.m. rotary machine driven by underfloor drive with a 12x12 steam engine, 300-ton traveling and crown blocks with 48-inch sheaves.

Taller Derricks

As drilling progressed to deeper depths, the trend in derricks has been toward taller and larger-based units, because of increased congestion by larger blocks and hooks and scarcity of floor room for racking long strings of drill pipe. Naturally, they also have been made with greater capacities to withstand the additional loads necessarily handled in deeper drilling.

Discovery of such fields as Rio Bravo, with 11,000-foot production, and Wasco, with 13,000-foot oil, has caused the 178-foot derrick with a 32-foot base to handle 120-foot stands of drill pipe to be used extensively in California. To a considerable extent the 136-foot derrick with 26-foot base has been replaced in these deep fields.

The Mid-Continent practice of using a raised floor with extended derrick legs, thereby eliminating the need for a deep cellar, is being adopted in California.

There is much speculation as to the feasibility of derricks 225 feet in height, and some reports of actual plans to construct such units for tests have been circulated. It is quite possible that further experience with 15,000-foot drilling will point out advantages of such a tall structure and bring about its manufacture.

It has been found necessary to install an intermediate finger to support 120-foot stands of 4½-inch and 5 9/16-inch drill pipe, and most operators are racking only 90 feet of 3½-inch drill pipe.

Among recent innovations is a 122-foot derrick with an extended window reaching nearly to the run-around, which facilitates handling of longer drill pipe, drill collar and casing sections.

Also new is the dual-taper derrick, which provides more room at the fourble board for racking pipe and for the passage of traveling equipment. For example, a 136-foot x 26-foot x 5½-foot A. P. I. derrick provides 210 square feet of space at the fourble board, while

7,000 FEET OF HOLE IN 8 DAYS

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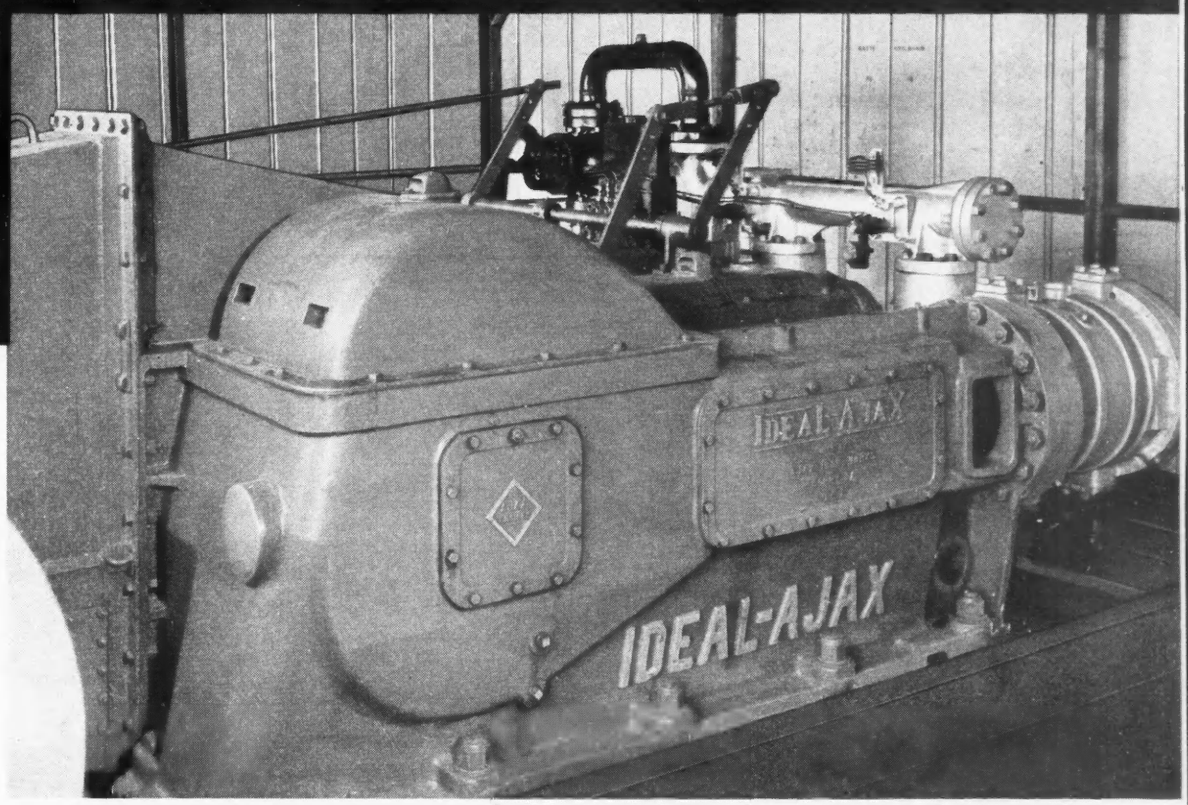

amazing record made
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No. 1 at Rio Bravo was
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rend to deeper holes and faster drilling is based on uperb performance of the equipment available to rn operators—and when it comes to selecting the e movers, they always come to AJAX . . . proving gain that Ajax is headquarters of the industry and *there's nothing like Steam for dependable power.* has the unrivalled experience, Ajax has the engineer- *ow-how,* Ajax uses the materials and craftsmanship nake IDEAL-AJAX first to be thought of when tough jobs are faced . . . first in the stamina, dependability, controlled power and speed that deliver the goods.

For more than sixty years, Ajax has been developing the unequalled qualities of *steam* drilling engines—and holds more world's records for performance than any other builder of any kind of oil field engine. See your National Supply man for the facts on the right type and size of Ideal-Ajax engine for *your* particular jobs!

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a 136x26x15x5½ dual-taper derrick provides 256 square feet at the fourble board, a difference of 22 percent.

The use of steel walks and racks is an incidental improvement, but provides greater safety and efficiency on the rig floor.

Larger Wire Lines

Wire lines at present can be made to carry safely much greater loads than those expected at 20,000 feet, so such operations should not be stalemated from this standpoint. However, wire rope manufacturers are not neglecting problems that will arise when new drilling equipment is designed, and their plants are being equipped to make a greater variation in wire rope design.

Deeper drilling has increased materially loads handled by rotary lines. One of the first steps taken to meet this condition was to enlarge the diameter of the wire rope. In the early days of rotary drilling, a 1-inch line was almost universally used. Later the size was stepped up to 1⅛-inch, then to 1¼-inch. Now 1½-inch lines are being considered.

While use of a larger line in the same construction design provides greater strength, there also are disadvantages. Larger lines are stiffer, which makes them harder to handle, and unless sheaves and drums are increased in proportion bending stresses become another important factor.

Development of more flexible types of rope has been significant. Tests have shown that the more flexible type of the same size and grade of wire is almost 10 percent stronger.

The rope in use on deep operations is of preformed type.

Manufacturers are on the alert for the development of new processes of wire drawing, which may eventually make it possible to introduce alloy steels in wire rope. While this is not yet an accomplished fact, it is entirely possible that a completely new type of wire rope will be developed by the time drilling has reached its present idea of maximum depth.

Use of higher derricks on deep operations, in order to increase the speed of the round trips, has introduced a problem of excessive wire rope wear. Consequently, wire line guides have been introduced that effectively reduce the whip of the line. Two of these guides installed on the line are said to cause a saving of 10 to 50 percent in wire rope.

Drill Pipe Assemblies

Equipment makers are using all available means at their disposal to effect improvements in drill pipe service. The design of the connection of the pipe to the tool joint, pipe material, fatigue values, methods of reducing or eliminating the disastrous effects of even slightly corrosive conditions, etc., are studied intensively.

One very definite trend in drill pipe is the use of an external rather than an internal upset on sizes up to 4½-inch O.D. This is particularly true in deep operations. This gives a flush inside diameter without weakening the joint and greater flow of mud to the bit with less pump pressure, both very important at excessive depths.

As well as bringing about the use of taller derricks, deep drilling has been responsible for the introduction of double-taper derricks, such as this one being used in the 13,100-foot Wasco field. Additional pipe room is provided at the fourble board by this type of construction.

Straighter holes, weight indicators to determine the amount of weight being carried on the bit, the use of a number of heavy drill collars directly above the bit to give the necessary weight for drilling without using the drill pipe for that purpose, (which would result in kinks), and protectors, all have played a part in improved results.

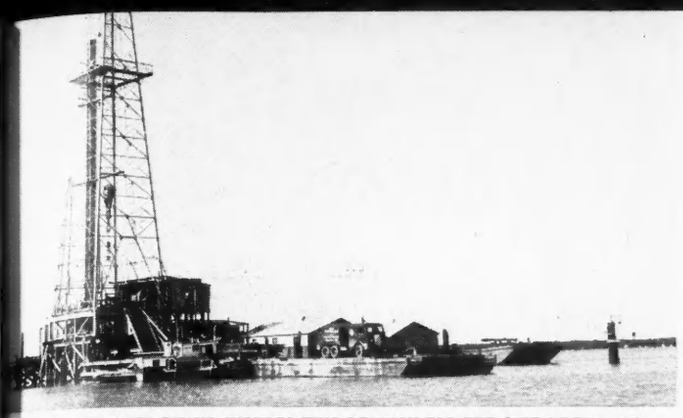
An alloy steel containing nickel, molybdenum and vanadium has been developed for drill pipe service, it has given excellent service life. It has a minimum yield strength of 80,000 pounds per square inch, minimum elongation of 25 percent in two inches, and minimum Charpy of 30 foot-pounds as measured on standard keyhole specimens.

Deep drilling operations require a high strength steel in drill pipe for supporting the weight of the string. However, considerably more is involved than just strength. The steel must have high fatigue strength with scratches, scores and slip cuts existing on the surface. There is no standard test that adequately measures this characteristic of steel.

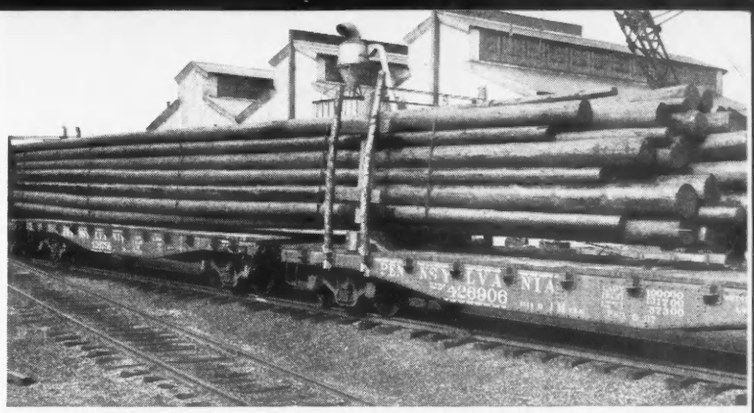
Threaded Connections

An important factor in deep drilling operations has been the marked improvement in the accuracy and finish of the threaded connections. Threads are being cut today that only a few years ago would have been considered unbelievably accurate. And this accuracy is being maintained on every piece by rigorous 100 percent inspection. Every threaded end of pipe or coupling is inspected for size, for taper over every inch of perfect thread, for lead over every inch of perfect thread, for thread depth, for finish, chatter, etc. After these threads are cut they are protected from damage by improved handling methods in the mill and by protectors during shipment. Improved methods for holding and supporting the coupling during makeup are employed so that the coupling will not be distorted and cause leakage.

Drill pipe with integral joints and external upset design has been designed for use in deep drilling districts. This pipe is made of alloy steel comparable to that employed in tool joint manufacturing, and



PRESSURE-TREATED PILING INSURES THIS DERRICK FOR THE LIFE OF THE WELL— The salt water rig must have a solid substructure that will stand all the weight, stress and strains of the derrick . . . it must be resilient enough to give slightly under the impact of boats and barges . . . it must last the life of the well. Pressure-creosoted piling from The Wood Preserving Corporation has proven most suitable for salt water rig substructures. The Wood Preserving Corporation supplied the pressure-creosoted piling for this derrick at Cedar Bayou, Texas.



THIS PILING SHOULD SHOW NO DECAY 35 YEARS FROM NOW. This photograph shows pressure-creosoted piling being shipped from one of the plants of The Wood Preserving Corporation ready for use. Piling pressure-creosoted 35 years ago was in fine condition when pulled up recently for re-location. Other installations pressure-creosoted and used along the Gulf Coast showed a similarly fine state of preservation when inspected by engineers. Insist on pressure-creosoted piling for your work.

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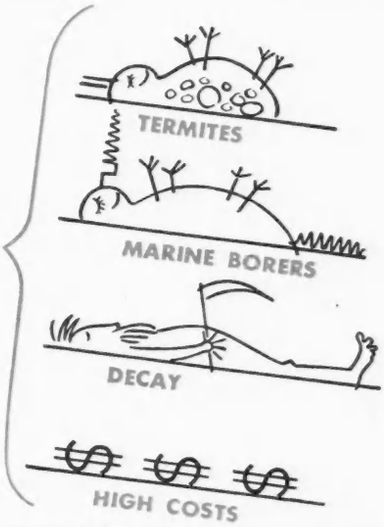

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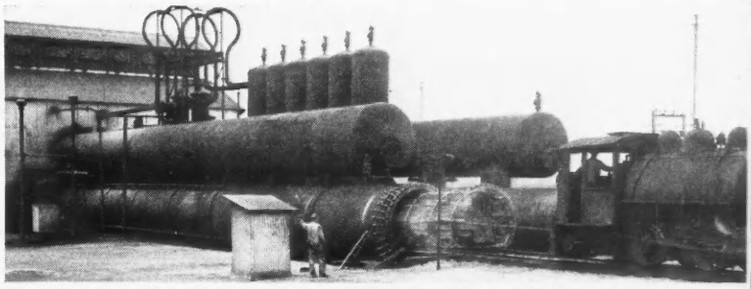
LONG SERVICE LIFE

PRESSURE-TREATED TIMBER IS THE MOST ECONOMICAL, LASTING MATERIAL FOR WALKWAYS AND RUNWAYS— It costs less than other materials which are as permanent. It requires no maintenance. Its long life eliminates the likelihood of any need for replacement.



HERE IS WHERE PRESSURE-TREATED TIMBER GETS ITS LONG LIFE— In huge cylinders like these, creosote preservative oils are driven deep into the pores of timber under 200 pounds pressure, so that it is toxic to fungi and wood-destroying insects, including termites and marine borers.

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the joint is upset out of the body of the pipe itself. This eliminates all joints except the regular box and pin connections.

Tool Joints and Collars

Major developments in tool joints and drill collars influencing deep drilling have been: (1) development of the drill stem, affording maximum bore for any given size of pipe with practically no increase in weight of the string; (2) elimination of shoulders; (3) improvement in pipe end construction to reduce failures in threaded sections of pipe; (4) use of drill collars to concentrate weight at bottom of string and aid in making straight hole; (5) improved methods of heat-treating collars, which include full-length treatment; and (6) improved methods of installing tool joints on the drill pipe, which have eliminated many of the washouts through pipe ends.

The introduction of tool joints with increased fluid capacity and less restricted return flow permits more rapid removal of the cuttings, and therefore greater drilling speeds. One manufacturer claims an area opening 46 percent greater than that in the external flush type tool joint in the 3½-inch size. The O.D. of this new tool joint is only slightly larger than that of the drill pipe, and this protrusion is gradually tapered so as not to obstruct free flow of cuttings.

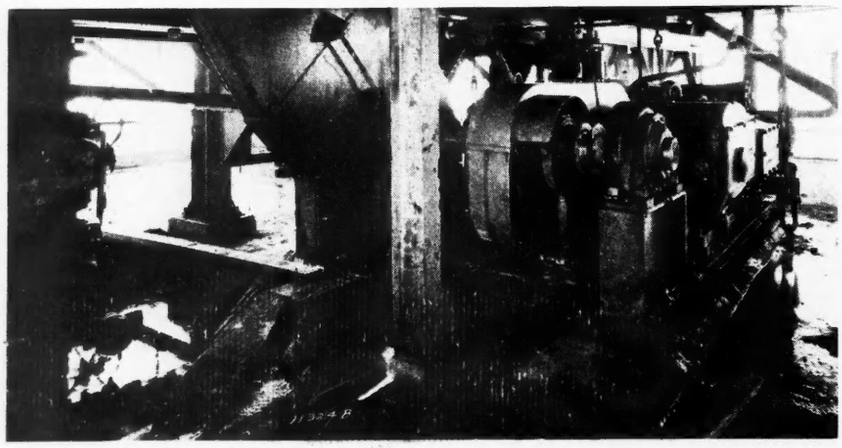
Use of 240- and 360-foot drill collar assemblies on deep California operations has focused attention on both quality and size.

A drill collar partially made of lead to give increased weight on bottom is being manufactured. It consists principally of a shell, or sleeve, made of lead, the lead cylinder being fitted around a joint of drill collar of drill pipe diameter. The sleeve assembly normally fits against a shoulder of the bottom of the drill pipe, but is free to slide upward over the pipe in case of trouble.

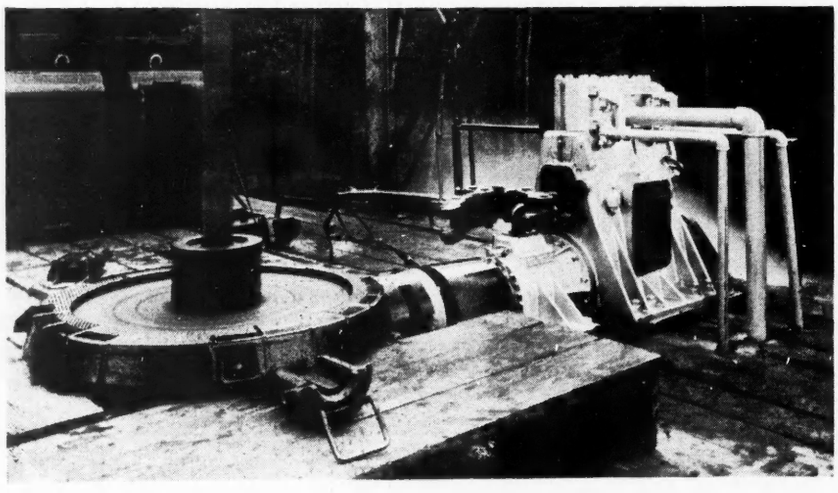
For deep drilling it has become quite general practice to weld A.P.I. tool joints to the drill pipe in order to prevent fatigue breaks at the last engaged threads.

A shoulder type of drill pipe connection has been designed for deep wells where high torques may be involved in attaining high rotation speeds, and where the tool joints wear rapidly and must be replaced frequently.

The "shrink-thread" joint is threaded with coarse Acme type threads and has a tapered seal to prevent leakage. The tool joints are heated and shrunk onto to the pipe with no lubricant being used.



Individual engine drives for rotary tables are another comparatively new innovation. The upper photograph shows an underfloor direct rotary drive, in which a 12 x 12 horizontal steam engine located beneath the derrick floor is being used to rotate by means of jack shaft and chain the rotary table directly above it. The lower picture shows a vertical type steam engine located on the derrick floor to drive the rotary table through a two-speed gear box attachment.



Pipe Protectors

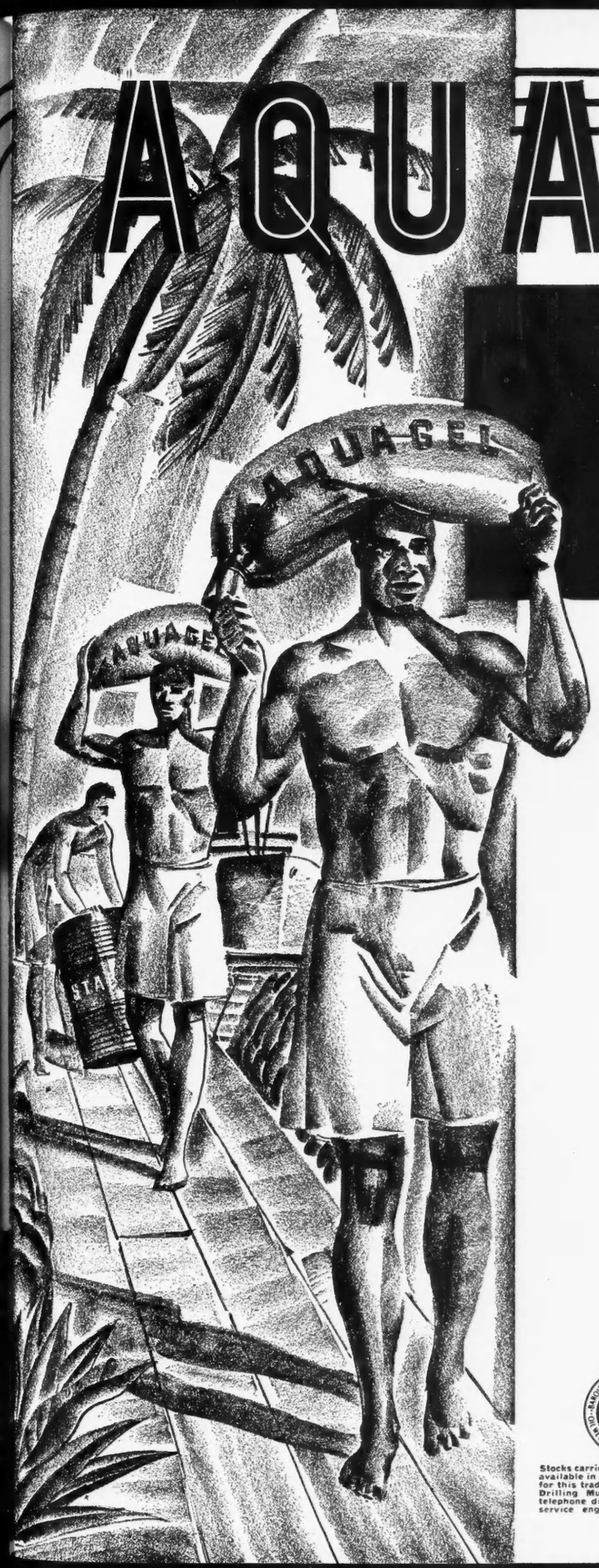
A number of factors associated with deeper drilling depths have necessitated changes in drill pipe protectors and created a greater need for their use. Faster hoisting speed has meant that rubbing against the walls during withdrawal has increased materially. Another factor is the increase in the size of the pumps and the increase in the velocity of circulation, which has required that protectors be designed to adhere more closely so as not to obstruct the flow more than absolutely necessary. As wells go deeper the temperatures encountered increase, and this has necessitated a change in the compound used so that the rubber will withstand the heat.

As drilling speeds have increased, operators have been faced with still another problem, and that is the whipping of the drill pipe at certain critical speeds. In many cases this has made it necessary to use slower speeds, which counteract the effect gained by the use of big rigs. As a result a long protector of special rubber made to drill in open hole has been designed, and is being used on many deep operations.

Improved tools for the removal of protectors from the drill pipe, which becomes quite a factor of economy on deep holes due to the large number of the devices used, is another advancement in this line of equipment.

Because many different sizes of tool joints and casing are in use, it has been necessary for drill pipe protector manufacturers to offer an increased number of sizes.

To foretstall failure due to mis-



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WHEN WATER from drilling mud enters oil sands, it greatly impairs their permeability. Therefore, the most desirable drilling fluid is that which prevents the infiltration of water and which will deposit a very thin cake on the walls of the hole which can be easily removed when the well is swabbed. Mud made from AQUAGEL and water accomplishes this to a maximum degree. It is also an economical method of drilling-in, because one ton of AQUAGEL will make as much as 100–120 barrels of mud. o AQUAGEL, for drilling-in provides not only a better method—but a less expensive method.

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aligned drill pipe there has been introduced recently an instrument whose function is the detection and location of drill pipe bends. The instrument consists of four targets that are strapped 90° apart at one end of a stand or joint of pipe and a telescope that is rotated at the opposite end. Deflected drill pipe will not parallel the line of sight, and readings on varicolored buttons on the targets will reveal the fact. Movement of the telescope will locate the bend in the pipe.

Detection of internal defects in drill pipe and casing by a system of mirrors and lenses is another innovation. Pictures can be taken of the defective areas, and the drill pipe repaired or discarded. In conjunction with this device is used a thorough internal pipe cleaning system, which applies an anti-corrosion compound after inspection.

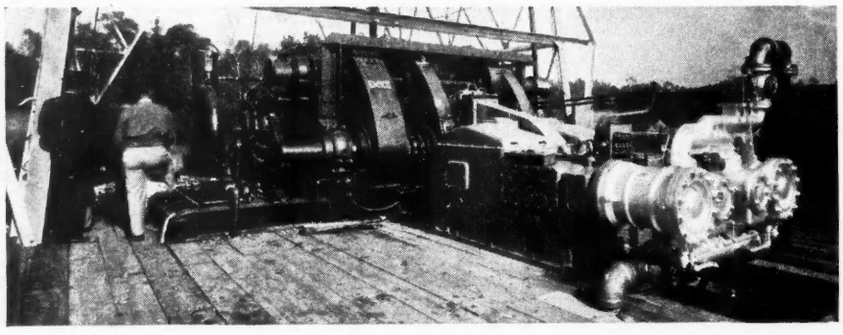
Better Rotary Tables

Rotary tables have been improved in many ways. Only a few years ago rotary tables were running with exposed gears having cast teeth. Today practically all oil field manufacturers are building almost exclusively oil-bath rotaries, completely enclosing the hardened, heat-treated gears, running them in oil. They are putting a substantial guard around the table. These tables are especially designed for high rotating speeds without developing excessive drawworks and engine drive speeds.

Changes in rotary drives have been important developments, several concerns have adopted individual engine drives for this operation. Such procedures provide better control of the drilling string, reduce wear and tear on the drawworks, chain and hoisting engine.

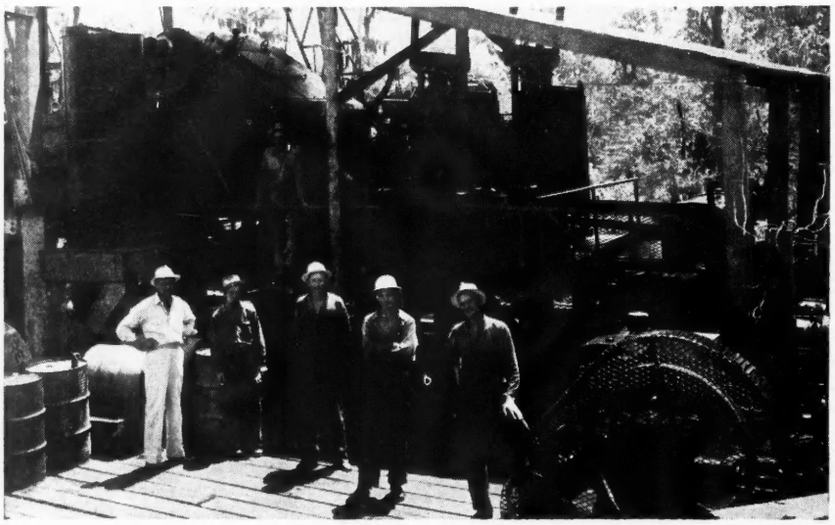
A high-speed oil bath rotary direct-connected through a geared speed increaser to a vertical twin-cylinder steam engine has proved effective through several years of usage. A two-speed gear box, attached to the frame of the engine, is a part of this gear box and gives additional flexibility without accompanying strains. Other types of individual drives use the horizontal type steam engine, in which the engine is placed beneath the derrick floor.

A late development in rotary tables is one with a spiral bevel gear, 2.76 to 1 gear ratio, 17-tooth or 14-tooth sprocket (optional), 51⅝-inch diameter, 350 maximum r.p.m., 20½-inch table opening for bit or casing, and 15,000-foot rated drilling depth. This heavy, high-speed table embodies improvements that have made possible new sustained rotating speeds in the Rio Bravo, California, field. The table is being driven direct at Rio Bravo with a 12x12 twin horizontal steam engine located under the derrick floor, the drive being upward by chain.



Four 130-horsepower superheated boilers supplied steam to the above 14x14 engine in the drilling of an 11,469-foot test in Southern Louisiana.

The two 225-horsepower Diesel powered rig below has just finished a 10,720-foot hole in the Louisiana Gulf Coast district.



Prime Movers Enlarged

Improved and enlarged types of steam engines have been introduced, both in the horizontal and vertical models. A wider adaptation of steam engines to operations around the drilling rig has encouraged manufacturers to meet new requirements. The general trend has been toward a heavier engine for a given job.

The recent introduction of a 15 x 14 twin horizontal type steam engine attracted wide attention in drilling circles. The new engine was first used in Rio Bravo field and is handling a 500-pound steam pressure successfully. It drives a heavy drawworks, the combination giving a substantial reserve power and safety factor for completing the 11,400-foot wells. Prior to introduction of the new engine, the larger size was the 14x14 model, which is being used extensively on deep operations.

A 10 x 9 vertical twin-cylinder steam engine with hand-controlled variable cut-off was introduced a short time ago. This engine was developed primarily for driving power slush pumps, direct rotary drive, and double engine drive, but it also has been used individually for hoisting on light and medium-duty rigs. Its size and design give it ample power for driving the largest power slush pumps and for

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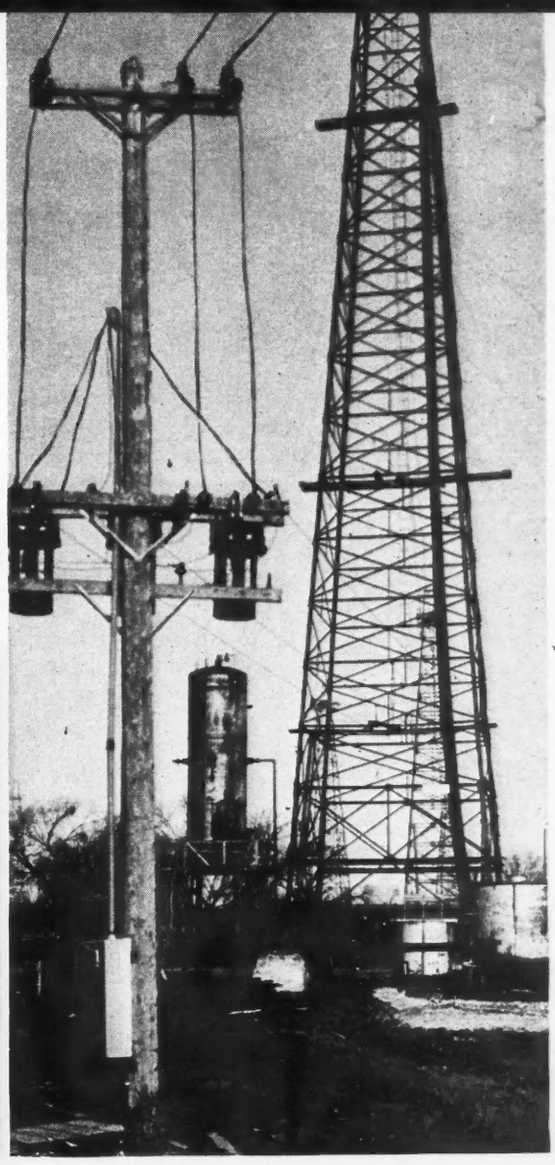

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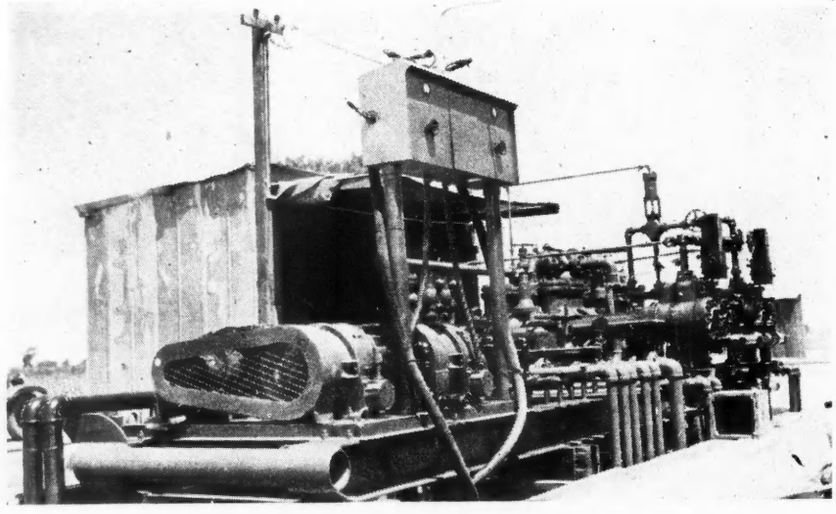
individual rotary table driving, while in a double engine drive two of these engines operating in tandem provide sufficient hoisting power.

Use of heavy internal combustion engines for driving drawworks and slush pumps has increased with the introduction of additional types and sizes. The new 8- and 12-cylinder models adapted to fuel oil, gasoline, natural gas or butane each show a load rating from 105 to 335 horsepower, depending upon the size and fuel used. The horsepower rating is considerably higher, however.

Several improvements in Diesel engine design have been announced. Straight mechanical and electric - mechanical driven rigs are used in deep oil field operations. Improved Diesel engines are available in various sizes and types ranging from the small straight mechanical type powered with two 100-125-horsepower engines up to the full electric or mechanical types using the combined power of two 400-500-horsepower engines. One manufacturer is known to be preparing to introduce a supercharged Diesel engine.

Deep drilling presents no particular problem from the standpoint of electrical equipment. Greater rated capacities will be required, but equipment of the same general characteristics as now used will be satisfactory. When the required capacity becomes larger, a multiplicity of internal combustion engines, a steam turbine or large induction or synchronous motors may be used as prime movers for variable voltage direct - current equipment. For example, two rigs having six 60-kilowatt generators were combined into one rig, with 700-horsepower the total continuous capacity of the two drawworks motors. Oil field motors and control for drawworks are available in ratings up to 350 horsepower, while motors and control for mud pumps and separate table drive are available in ratings up to 500 horsepower.



The unitized boiler feedwater plant has gained in favor in all deep drilling districts. The one shown here is automatic in action, being equipped with pump governor. The 10 x 6¼ x 10 pumps used are the largest ever installed for the purpose.

Bits Advance

Important advancements in bit design have been among outstanding contributions in the progress toward deeper drilling. Improved flush systems have been developed to make the large pumps now used more effective. Better bearing construction, aided by the introduction of stronger and more wear-resisting metals, has provided a larger factor of safety against the increasing weights and speeds used on bits in present day practice.

Marked economies in deep holes are realized by use of modern bits; the number of round trips per well is reduced, the hole tends to stay straighter, and cutting speed is increased. Highly developed hard facing and its correct application have added considerably to the life of bits and their ability to maintain a full gauge hole. Adjustment of tooth structure to formation and drilling conditions peculiar to the different regions has improved measurably the perfomance of rock bits.

Bits for softer formations, such as shale, also have advanced materially and have increased drilling speeds greatly. One such bit has widely spaced, deep chisel teeth, and is designed to drill soft shale formations as well as hard shells encountered between the softer strata. It incorporates an improved flush system in which the water nozzles, made of wear-resisting alloy, direct the flushing fluid most efficiently for proper cleaning. Its geometrical construction is said to aid in drilling straight hole.

A new method of rock bit assembly is claimed by one manufacturer. Each individual support is made an integral part of the body to increase the solidity of the bit.

Improved Steam Plants

The rigorous demands of deep drilling have worked several changes in boilers and steam plant arrangement and equipment. Outstanding among these developments have been higher working pressure boilers, more efficient superheating units, and the introduction of central steam generating plants.

The trend has been toward greater boiler pressures, with 350-pound steam pressures in common usage, and one company is using five 500-pound 130-horsepower boilers, largest in existence, on a California rig.

The trend in boiler design is toward larger fireboxes with shorter barrels of larger diameter, which give a higher stack temperature and increase the steaming capacity of the flues. Welding of fireboxes and troublesome seams is a common fabrication practice.

Low - pressure draft - controlled burners, insulating blankets, low water alarms and water treating are but a few of the additional items that have helped to bring boiler efficiency to a point where it is no deterrent to deeper depths than those being drilled today.

Unitization through skid mounting and standard external piping practices have partly eliminated arrangement time loss by untrained

field forces, and have cut moving and installation costs materially.

Superheating has contributed striking advances to steam generation. Superheaters are now available in both integral and separately fired styles.

Comparatively recent refinement in the integral superheater includes an independent control, which allows control of the degree of superheat, a feature possessed by the separately-fired superheater from the start. The integral superheater is interchangeable among all makes of boilers. Saturated steam from the boiler enters the elements, is superheated, and discharged into the steam line.

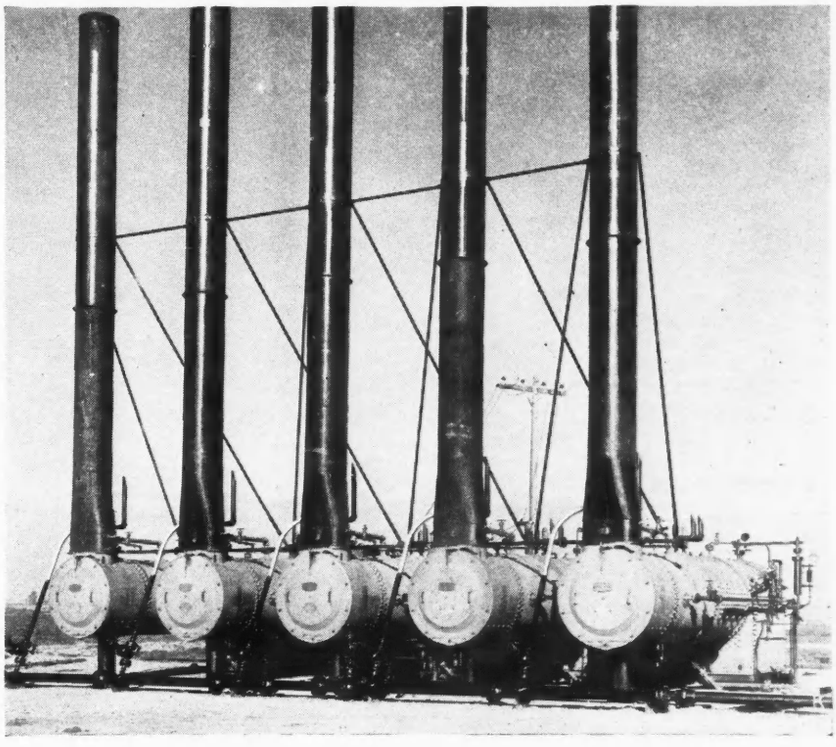
Another important development in steam-generating equipment was the introduction of the portable superheated steam generator. This unit comprises a locomotive-type boiler with large-firebox, short-tube construction and a smoke-box superheater. The entire unit is mounted on steel skids for portability and is furnished complete with unitized piping. Because of the short tube, maximum effectiveness is obtained from the entire heating area of tube heating surface. In this particular unit the hot gases leaving the tubes are not wasted but are utilized for superheating in the smoke-box superheater. Superheated steam is furnished to the rig at 350 pounds per square inch pressure.

The utility of central steam generating plants and the role they will play in future deep drilling is not a matter for definite statement. However, it appears that such plants as the one installed in Wasco field by Continental Oil Company, by which several wells are to be drilled without moving the boiler setting, will figure in many deep drilling development campaigns.

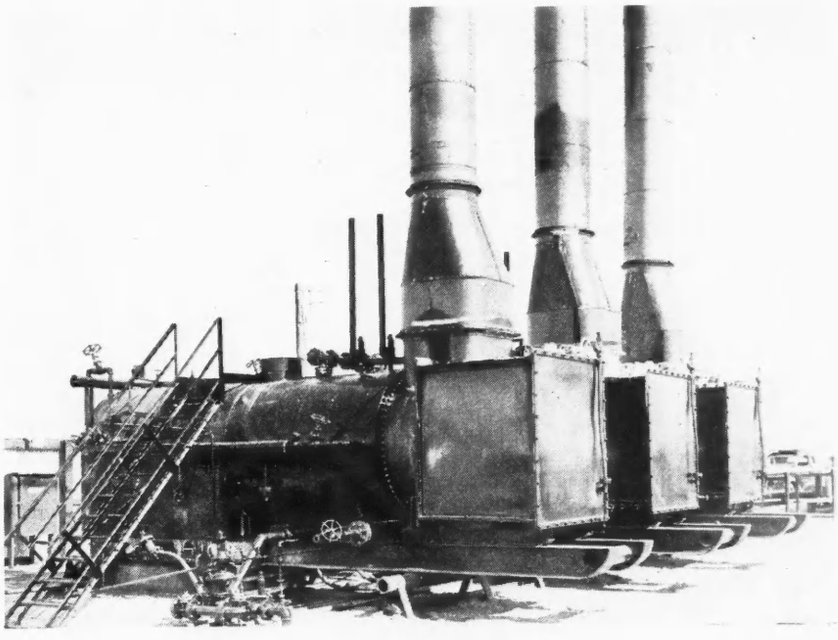
Boiler feedwater plants have been unitized and improved until they are virtually automatic in action. Capacity has been increased and broader utilization of waste steam has been made possible for heating the incoming water. In many instances incoming water is heated to 200° or higher by direct-mixing contact with exhaust steam. The latter condenses and is returned to the boilers, minimizing the amount of raw feedwater required.

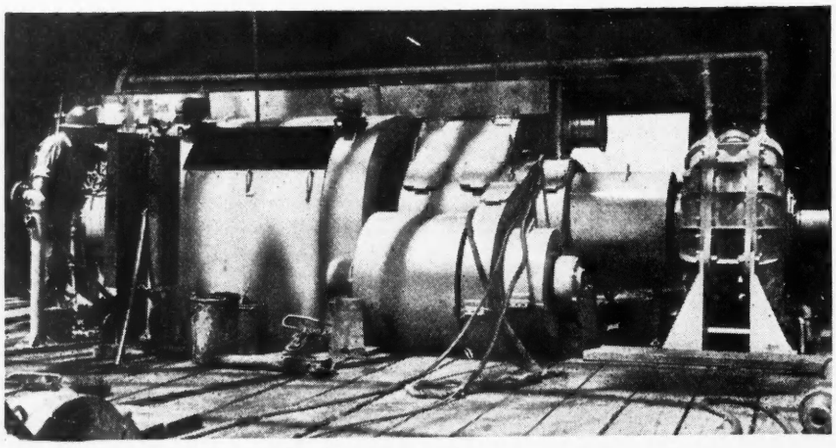
Completely unitized boiler-feeding plants, which include feedwater heater-pump, a conventional boiler-feed pump for standby and miscellaneous service, and turbo generators or other accessories are offered. All are unit-mounted on portable skid-type steel bases. It is necessary to make only four connections when installing at a new location.

A late development in boiler feedwater plants consists principally of two 10 x 6¼ x 10 feedwater pumps, automatic pump governor, feedwater control, skimmer for removing oil from the exhaust steam, and simple connections. The electric generators are mounted on one



Enlarged and superheated boilers are favored for deep operations. Above is a battery of five 500-pound working pressure boilers, that normally would deliver steam at a temperature of 465° but superheating has boosted this to 640°. The superheated steam generators below form a central steam generating plant at Wasco, California. Several 13,100-foot holes will be drilled by power from this plant, which delivers it to the rig at 350 pounds pressure.





This new type unitized 48,220-pound drawworks has enlarged drums to accommodate additional wire line length for deep drilling, and is equipped with 40-inch double rotor hydromatic brake. The drive is from the engine to the jack shaft instead of a line shaft.

end of the heavy foundations and move with the pumps as a single unit. The pumps are as large as those used for slush pumps during earlier rotary drilling days. One such unit supplying water for five 500-pound 130-horsepower boilers requires little attention.

Drawworks Unitized

The trend in drawworks design is a pronounced departure from practices just a few years ago. Greater attention has been given to enclosing the moving parts and unitizing. The guards are more substantial, the chains are entirely enclosed in many instances, and life has been prolonged by better lubrication. The latter includes oil bath lubrication for chains that greatly prolongs their life. Shafts, sprockets, and bearings are consistently being made of better material so heavier loads can be carried safely. The modern drawworks is unitized, much more rigid and freer of vibration than its forerunners.

Superior Oil Company is using a 48,220-pound unitized assembly in drilling Moody 1 in Rio Bravo field. This unit, completely enclosed and skid mounted on a 22-foot base, uses three speeds and no line shaft drive, the drive being from the engine to the jack shaft and thence to the drum shaft. To spool the greater lengths of line used on 178-foot derricks, the drum is 28 inches in diameter by 46 inches long, and has a spooling capacity of 4960 feet of 1¼-inch line.

The faster hoisting and drilling speeds made possible by modern drawworks and greater prime mover power necessitated increased braking safety. On top of enlarged hydromatic brakes of the 40-inch type came the introduction of the double rotor hydromatic brake. In effect these units are two brakes in one. They are independently mounted, and connect to the drum shaft with a disengaging gear.

Many California operators are now using two hydromatic brakes, one on each end of the drawworks shaft. It is their claim that the two brakes provide maximum flexibility and braking power, and also a reserve for emergency use.

Chain Standards High

Advancements in chains naturally have been affected by the increased necessity for faster and deeper drilling. The evolution of oil well chains to their present day high standards has been one of continuous improvement. Metallurgy, precision manufacturing, and advances in design wrought through constant research indicates chains are dependable for deep operations. Strength is attained by correct design and the use of carefully heat-treated special alloys. Efficient operation results from finely finished bearing surfaces, which minimize friction and provide a smooth-running chain. Dependability is assured by accuracy in manufacturing, precision fit of component parts and the ability to resist wear.

Ground pins and bushings have become standard with the industry, providing close tolerances. Today strength of chains has been increased to more than 345,000 pounds tensile in triple strand types.

Most manufacturers of chains offer at least five types for different kinds of drilling conditions.

The possibilities of wider usage of multiple stranding appear almost limitless in the event that further strength is required.

Mud Equipment

There have been important changes in mud equipment, from the small testing devices to the slush pumps.

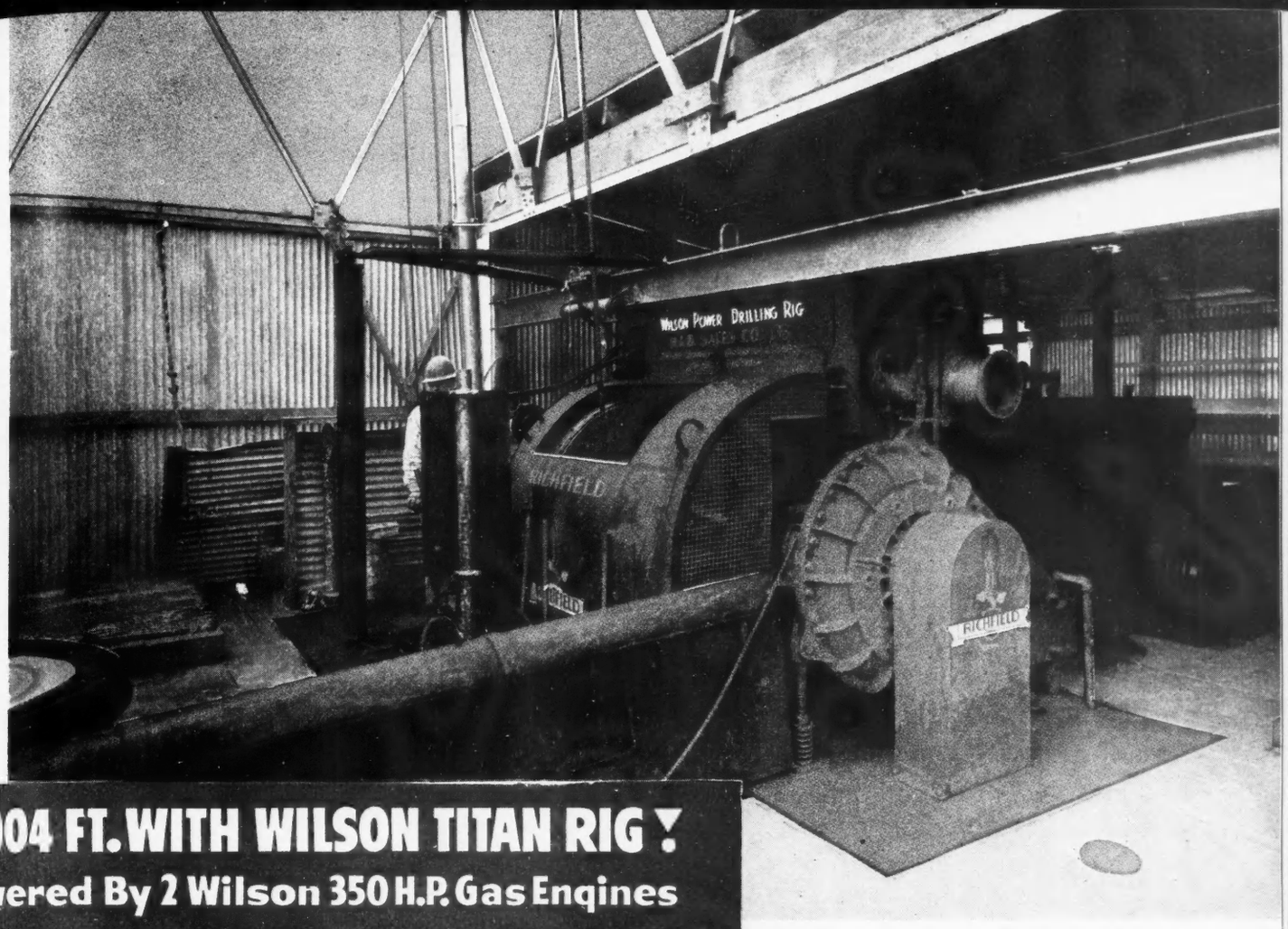
In California the 15½ x 8½ x 20 or 16¼ x 7¾ x 20-inch pumps are being widely used on deep wells, but a new 15½ x 9¼ x 22-inch pump is being used by one operator. The latter, the largest yet constructed, operates on a 500-pound steam pressure. Obviously the larger pumps give a greater rate of mud circulation.

One manufacturer has developed a slush pump of new design with the view of increasing the efficiency and safety to the operators of the pumps. The steam valves are located below the cylinder, and the rocker arms are hung below the cradle, an arrangement that permits a smooth top above the cradle that is entirely free of moving parts.

A 7¾ x 20 power slush pump has been developed for heavy-duty drilling. An outstanding feature of this large pump is the elimination of separate main bearing caps. Each complete main bearing supporting structure is an integral part of the rugged power-end frame. This pump has performed satisfactorily on 13,000-foot wells. It is being extensively used with variable cut-off steam engines. With the engine operating at higher speed than the pump, and the cut-off used to control the speed, maximum steam economy is said to be effected.

Steel mud ditches and mud tanks are being adopted and are noteworthy because of their savings on mud and excavating costs. In addition, the tanks are easily and quickly installed, are practically 100 percent salvagable, and assist in maintaining better mud conditions.

An important comparatively new mud testing instrument is the portable filter test for determining wall building characteristics. A sample of mud in a glass container with a filter medium at the bottom is sub-



004 FT. WITH WILSON TITAN RIG

wered By 2 Wilson 350 H.P. Gas Engines

HFIELD K.C.L. No. 1 IS DEEPEST WELL EVER DRILLED
H INTERNAL COMBUSTION POWERED MECHANICAL RIG!!

● *Detailed description of Wilson rigs can be found on pages 2273 to 2279 of The Composite Catalog and Pages P-48 to P-57 of the Drilling Equipment Directory.*

● Wilson sets another record . . . this time on the Richfield Oil Corporation deep test well, Wheeler Ridge, California, where a Wilson Titan Model Rig has already drilled to 11,004 feet, and may yet go deeper. To our knowledge, this is the deepest well ever drilled by an internal combustion powered mechanical rig.

After keeping a close contact with this particular drilling job, the manufacturers feel that the performance of the Wilson "Titan" Rig was highly satisfactory and comparable in drilling time to a steam rig, with the advantage of extremely worthwhile savings as described below.

The drilling time is illustrated by the following examples:

From 9272 feet on April 8th, hole was made, of which 25% was cored, to 10,400 feet by May 2nd, from this point and date all the hole was cored to 11,004 feet by May 18th.

Here are hole sizes, sizes and lengths of drilling strings and amounts and weights of casing strings set:

26-inch hole drilled to 1570 feet where 18⅝-inch slip joint surface casing set; 12¼-inch hole to 8562 feet with 8⅝-inch, 38-lb. casing; 8½-inch hole to 9272 feet, then 7⅝-inch hole on to bottom of 11,004 feet, then underreamed from shoe of 8⅝-inch at 8562 feet to 10,815 feet where the string of 6⅝-inch, 26-lb. casing was set and cemented. Both drilling and coring done with 5 9/16-inch, 22.2-lb. drill pipe to about 6000 feet; 4½-inch, 16-lb. drill pipe to 9000 feet; 3½-inch, 15½-lb. drill pipe to 11,004 feet.

FUEL COST LESS THAN $4.00 PER DAY . . . Rig Virtually Pays for Itself . . . It is estimated this Wilson Rig has already paid for itself thru savings in fuel, repairs, etc., as compared to use of steam equipment. The average fuel cost to drill 11,004 feet of hole amounted to less than $4.00 per day, say operators of the rig who also say that approximately $40,000 already has been saved in fuel, boiler repairs, fireman's pay, and rigging-up time. Thus the savings alone are almost equivalent to the initial cost of the rig, which means that the Wilson Titan Model Rig virtually paid for itself in the drilling of one hole, and is still capable of drilling many more!

Wilson
MANUFACTURING CO. INC.
WICHITA FALLS, TEXAS

Export Office: 30 Rockefeller Plaza, New York, N. Y.

EXCLUSIVE CALIFORNIA DISTRIBUTORS: H. & B. Sales Co., Ltd., Long Beach, California

jected to pressure for 30 minutes to determinte the rate of water filtration and mud cake thickness.

Mud guns and mud gun nozzles have been developed, which effectively mix the mud and closely control the viscosity. Another item is a device known as a pipe wiper, which allows the operator to withdraw the drill pipe without diluting the mud with wash water. It also adds to the efficiency of the operation, closing off the hole so that the danger of dropping small articles is minimized. The safety of operations is increased also, as there is less mud on the floor of the rig.

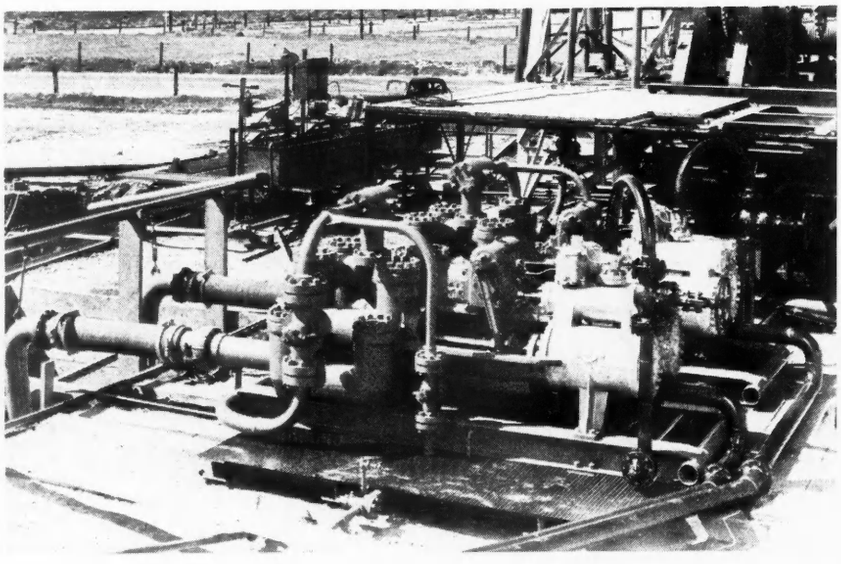
Rotary hose, both steel and rubber, and couplings have been improved and strengthened. A recent development in rotary drilling hose is a two-section arrangement. In case of failure in either section of the hose, the middle connection may be broken and the undamaged end of the hose pressed into service as a complete hose. Considerable attention is being devoted to fluid passage channels in hose, and the trend is toward the elimination of any restrictions and also excessive bends. The coupling trend is toward a heavy, integral type that outlasts the hose and is used over and over.

Shale shakers or vibrating mud screens are used on practically all deep operations, and older models have been improved materially.

Centrifugal separating equipment also is being employed to remove undesirable materials from the mud column. A fraction of the mud stream is by-passed into the centrifuge, where substantially all the weighting material concentrates in the underflow of the apparatus and may be returned to the circulating stream.

An interesting and very recently developed use of the centrifugal mud separator, under an entirely new process, is in combination with a flotation machine. With such equipment, waste mud containing valuable weighting material, may be centrifuged. After being dewatered and dried, the flotation concentrates are ready for use on other drilling operations.

Mud sampling machines are also available that maintain a constant check on the quality of the stream.

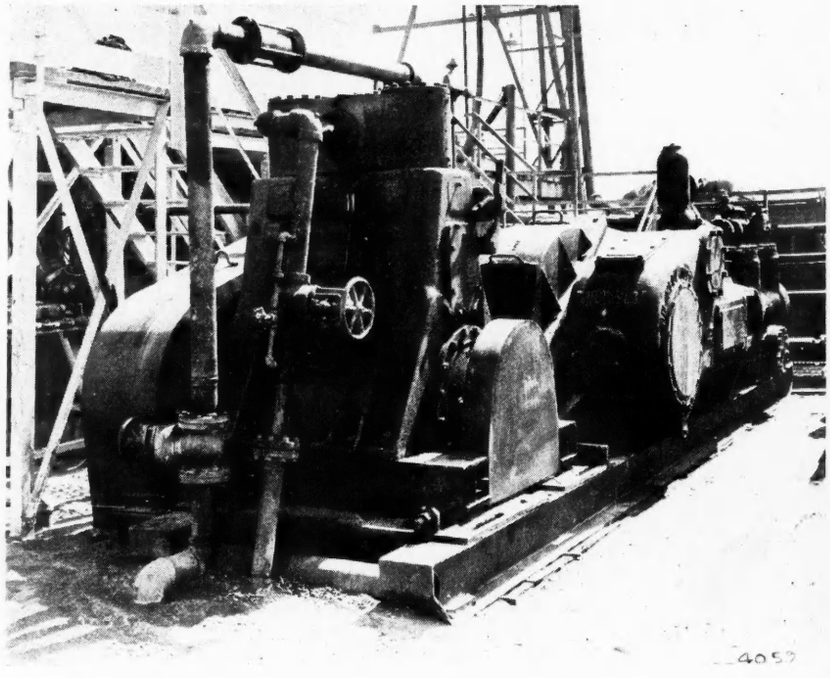


Drilling Control Instruments

Modern deep rotary drilling practices virtually eliminate the old rule-of-thumb methods of drilling control so prevalent in oil fields a few years ago. Today operators depend on instruments for controlling weight and pressure and for obtaining accurate information on drilling progress.

In deep drilling operations especially, a close watch of weight on bit, rotary speed, mud pressure, load on derrick and drill pipe torque is vitally necessary to efficiency, economy and safety. These five factors are controlled by instruments in use today.

Since 1935 several new instru-



The trend in slush pumps for deeper drilling is toward larger units. The upper view shows two 15 x 9¼ x 22-inch pumps, the largest now in use, that are operated on 500 pounds steam pressure. The lower illustration shows a 10 x 9 vertical steam engine with hand control variable cut off driving a 7¾ x 20-inch slush pump at a 13,000-foot operation.

CEMENTING 13,000-ft. WELLS IS ROUTINE—with UNAFLO!

Here are a few of the hundreds of deep, high-temperature holes handled successfully by this cement with the retarded set:

AT LAKE LONG, southern Louisiana, wells with bottom hole depth of over 13,000 ft. and temperature of 310° F. are *regularly* cemented and squeezed with Unaflo Oil Well Cement. And the result? Complete satisfaction.

A major oil company in southern Louisiana did a retainer squeeze with Unaflo in a well of over 12,000 ft. with bottom hole temperature at 335° F. On this job, truck pressure reached 6,000 lb. per sq. in. After the squeeze, the excess cement washed out was, according to the District Engineer, *as fluid as when mixed!*

In a 9,000-ft. Dickinson well, Unaflo was pumped at intervals for 3½ hours at 217° F. bottom hole temperature. Yet the heavy slurry pumped as freely at the end as at the start of the operation.

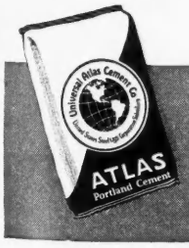
Yes, it pays to play safe with Unaflo,—the easy-flowing, hard-setting cement with the retarded set!

Send for "Oil Well Cementing Guide," which tells about Unaflo and its particular adaptability to Mid-Continent conditions. If you are in the Mid-Continent field, write *today*. Put your request on your business letterhead. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), Amicable Bldg., Waco, Texas; Kansas City; Tulsa; Oklahoma City.

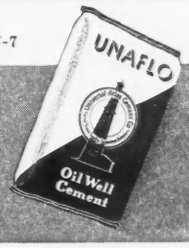
12 Good Reasons for using UNAFLO!

1. Gives you more time to get it down.
2. Mixes and places easily with 35% water, thus eliminating need for excess water.
3. Follows irregularities of well bore and casing.
4. Easier to regulate viscosity at tub.
5. Hardens thoroughly with high density after placing.
6. Not stiffened by mud contamination.
7. Not affected by salt water contamination.
8. Sets satisfactorily in sulphate water.
9. Meets the requirements for sulphate resistance.
10. Makes squeeze and plug-back jobs easier, surer, more successful.
11. Permits operator to control cement rather than being controlled by it.
12. Has been proved by oil industry by consistently "coming through in the clinches."

OW-U-7



Universal Atlas CEMENTS



ments for maintaining accurate drilling control in deep wells and for providing operators with useful information for future guidance have been introduced.

For example, one of these developments is the recorder of the rate of penetration. This instrument provides a written record that gives definite information on the rate of penetration of the bit through various formations; it gives valuable data on equipment service.

Another important development has been the designing of improved tachometers, which provide a larger, more easily read device for accurately controlling rotating speeds. In deep wells the efficiency of drilling is determined largely by the ratio of three factors: mud pressure, weight and rotary speed. Unbalancing one or more of these factors often reduces equipment life and increases costs. The new tachometers inform the driller at a glance of the actual speed of rotation, enabling him to correlate speed, weight and pressure and to govern other phases of drilling operations accordingly. The deeper the well, the more important this correlation becomes.

Heavier, more sensitive and accurate weight indicators represent another advancement in drilling control instruments. The newer types can provide readings on wells deeper than any drilled thus far, and are illuminated for night work, as deeper drilling naturally involves greater loads and weight indicators become more important. Moreover, modern drilling practice on deep wells is to hold the drill string partially suspended, letting tandem drill collars provide the weight on bottom. This requires more accurate, sensitive and long-range weight measurers if pressure on the bit is controlled correctly at all times.

Casing Changes Under Way

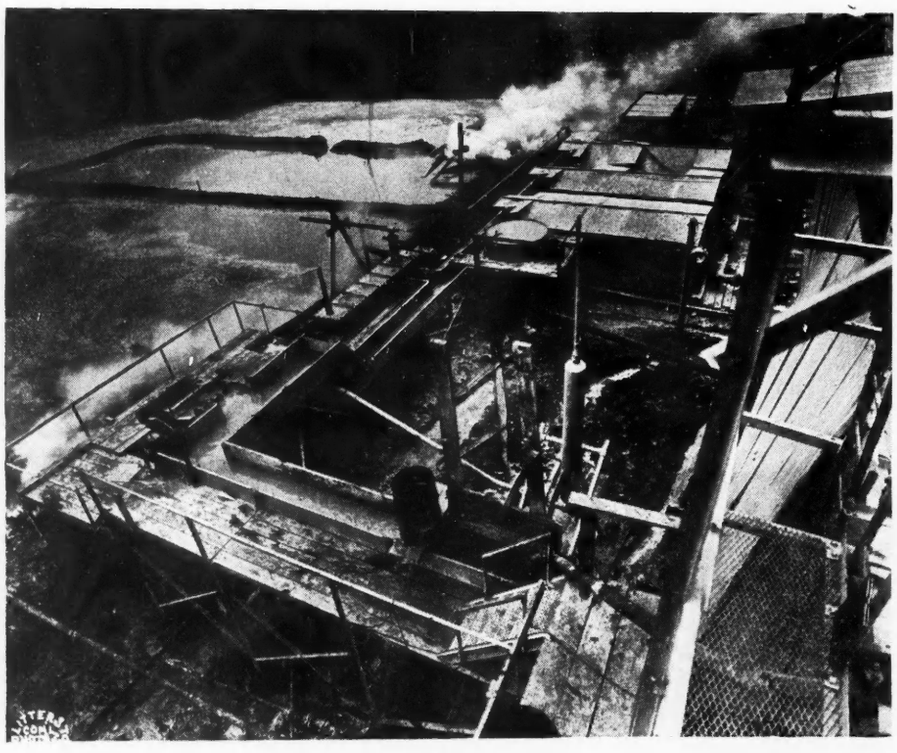
Changes in casing design and specification are under way to meet severe conditions encountered with greater depths.

At the American Petroleum Institute meeting in Chicago last November a new grade of steel to be designated as "N-80" was proposed. The new grade has a minimum yield strength of 80,000 pounds per square inch, as compared with 55,000 pounds for Grade D and 45,000 pounds for Grade C. The N-80 steel in 7-inch 24-pound casing would set 8200 feet, and in 7-inch 32-pound casing would set 13,100 feet with a factor of safety of 1½. Seven-inch 38-pound pipe of this steel would set at 16,100 feet. This grade thus would appear to provide the resistance to the external pressures encountered in the deep wells.

Casing manufacturers are devoting considerable study to casing design and joints, with the result that there is a trend toward smooth joint pipe and inside upsets. It is possible to increase the strength of the A.P.I. threaded joint from 15 to 50 percent by an inside upset that will pass the A.P.I. drift. A series of tests conducted by the American Petroleum Institute on leaky joints has assisted casing manufacturers. It now seems that either the regular Briggs thread or the drill pipe thread, when cut to the present mill standards and made up with reasonable care in the mill and in the field, will be tight against leaks.

A new development in casing that is not yet on the market comprises a bell and spigot type joint, but with coarse Acme type threads designed for high pullout strength. Resistance to leakage is obtained by one bead of weld around the joint which is applied while the string is being supported from the elevators. It is said this threaded and welded joint can be run faster than the bell and spigot or the buttweld type. Two experimental strings have been run in the Gulf Coast with success.

Another comparatively new type of casing utilizes modified square-type threads, which the manufacturer states corrects the tendency of the joint to "jump out" under tensional load and which forms a



Steel mud ditches and mud tanks have been introduced. They offer savings by eliminating pit excavations, are nearly 100 percent salvable, and assist in maintaining better mud conditions.

Every one of the 16 wells drilling below 10,000 feet in the Texas-Louisiana Coastal Belt (July 1) are depending on TESCO Good Steel Castings to help them safely and surely down to pay
TEXAS ELECTRIC STEEL CASTING CO.
GOOD CASTINGS
TESCO
HOUSTON, TEXAS
TESCO STEEL IS GOOD STEEL

good seal. There is an additional seal in the special shoulder. This casing is furnished in either regular wall or internal upset design.

Important advancements in the art of welding casing strings, tending toward faster operation and better metals, have eliminated difficult conditions encountered in this type of work.

Crown Blocks Capable

The latest enlargements of heavy-duty crown blocks will be contributory to 20,000-foot drilling. Changes made in the supporting I and H beam base members, in the trunnion and shaft assembly, and in the sheaves have resulted in a product whose strength can be made over twice as great as the greatest load ever recorded upon the deep drilling operations of the past few years.

A survey conducted by this publication recently indicated that the greatest load attained in deep drilling, even with stuck drill pipe was not likely to exceed 600,000 pounds, which is the safe working capacity of the third largest size block available. The largest block yet offered has a capacity of 600 tons and the theoretical dead loads at 20,000 feet approximate only ½ of 600 tons, leaving half the block strength to withstand impact loads.

"A" frame construction of the trunnions is a refinement that distributes weight equally upon all derrick legs. Single sheave pin types of block are becoming more prevalent, even in the 7-sheave sizes. Double deck and staggered axe blocks, also built to deep drilling specifications, are available. Small sheaves, detrimental to wire rope in that they magnify bending stresses, have all been replaced with manganese steel sheaves that run to 48 inches in diameter. Roller bearings, bronze bushings, and forged shafts are keynotes of the newer type of construction.

Traveling Equipment Strengthened

All traveling equipment has been strengthened, some manufacturers offering these in 500-ton capacity sizes.

Traveling blocks have been streamlined to provide greater clearance in the derrick when stacking long strings of drill pipe. Sheave diameters have been increased to 48 inches. Sheaves and sheave spacers are of the best steel, which with fine machining assure long life for the block and the wire line. Improvements have been incorporated to provide ease of manipulation by the workman.

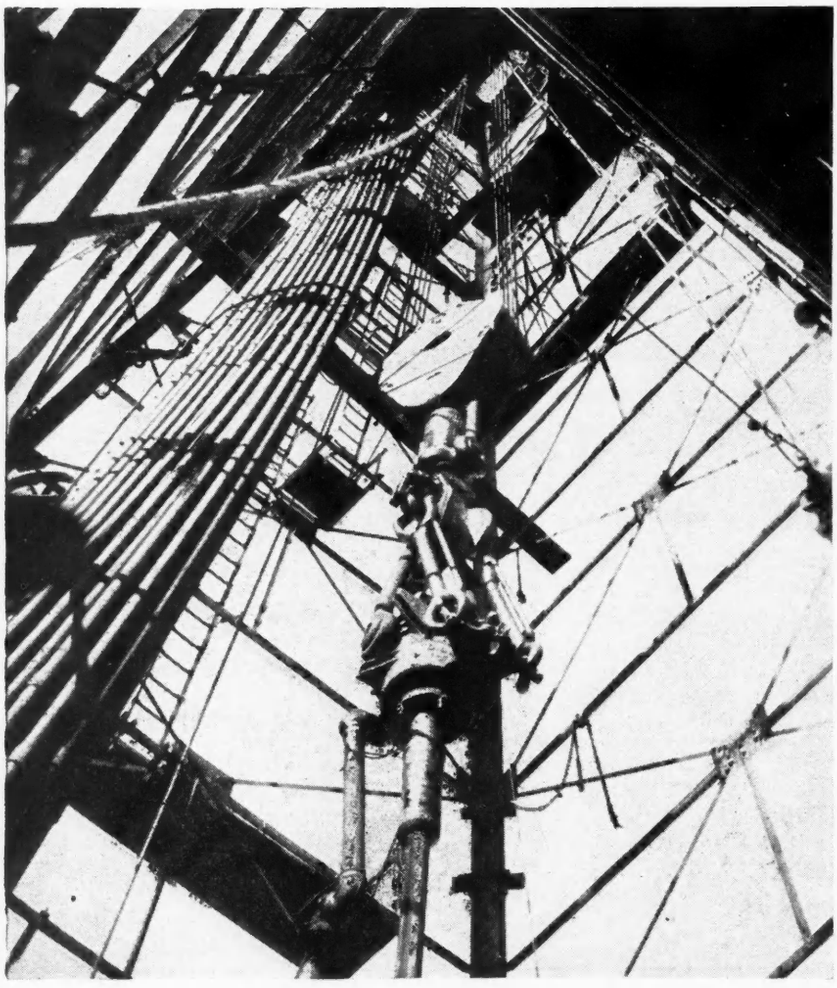
With both hooks and elevators to carry ever-increasing loads of drill pipe and casing as deeper drilling continues, manufacturers have not only increased the load-carrying capacity of these products, but have combined facilities for fast handling and convenience of operation. Some concerns are making 500-ton capacity casing hooks, while another furnishes a 300-ton capacity hook with a safety factor of three.

Elevators for handling extremely long strings of drill pipe are in use. Safety from a load-carrying standpoint has been emphasized by manufacturers, but important improvements for faster operation have been included, thus effecting savings in time required for round-trips at greater depths. Full heat-treated bodies for drill pipe elevators are proving popular.

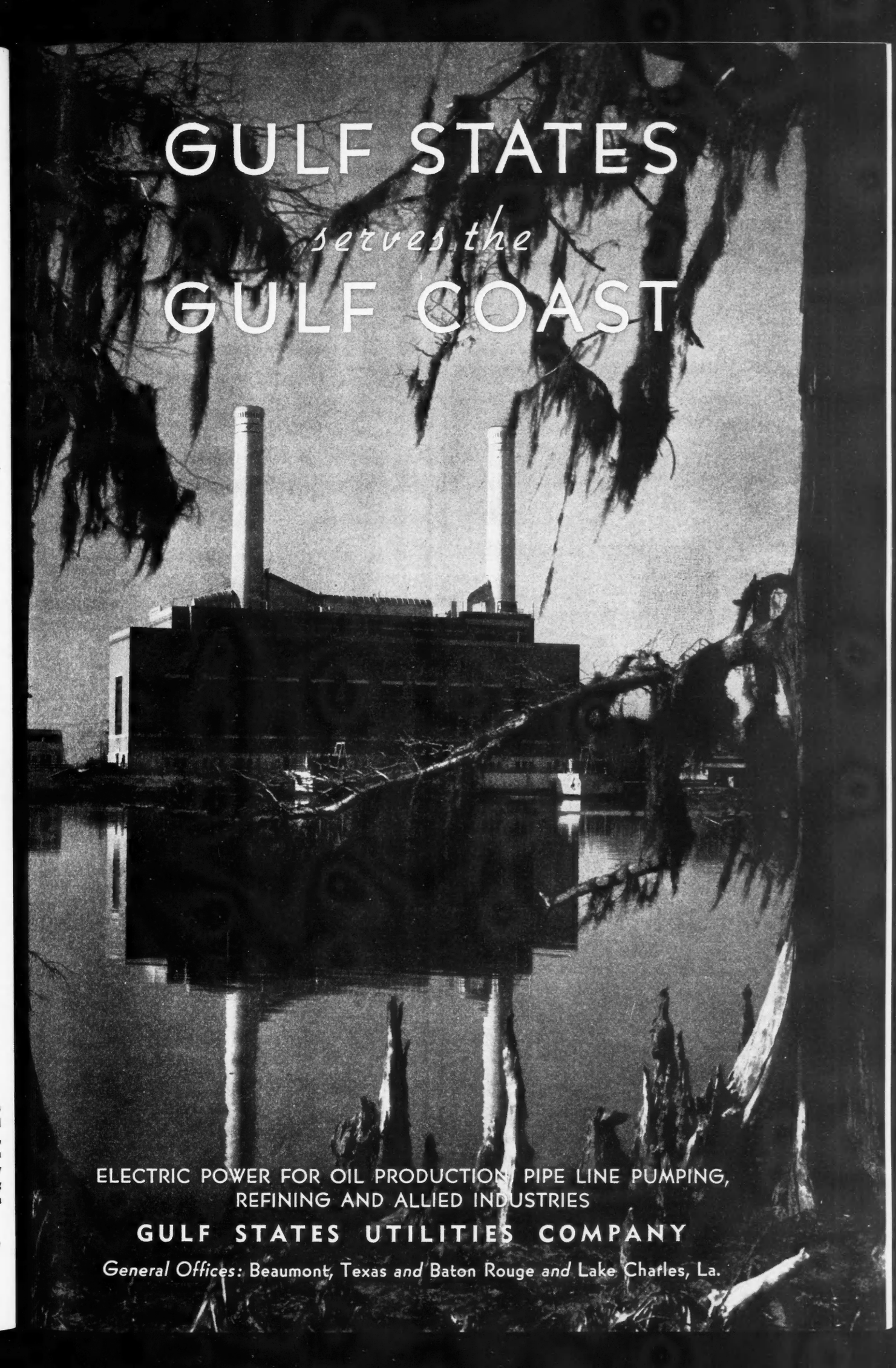
Tongs likewise have been designed and redesigned to expedite making up and breaking out of strings of drill pipe.

A new innovation is the rotary connector, which replaces the conventional rotary hook. Bail, spring and rotating characteristics are similar; the primary difference being the use of independently slung links between the connector and the elevator that assume the function of the open hook.

Heavy-duty swivels have been developed for the deepest drilling. In process of development is a new type of rotary hydraulic swivel having a capacity of 500 tons at 500 r.p.m. In drilling deep wells at high speeds there has been quite a problem in connection with vibration and pounding of swivel bails against the swivels. A so-called swivel bumper, which has a



Every part of drilling equipment has been refined. Larger and greater load carrying wire lines, traveling blocks, elevators, swivels, hooks, etc., are in use on the deeper operations. The view here shows equipment used in drilling Continental Oil Company KCL A-2 to a world record depth of 15,004 feet.


GULF STATES
serves the
GULF COAST
ELECTRIC POWER FOR OIL PRODUCTION, PIPE LINE PUMPING,
REFINING AND ALLIED INDUSTRIES
GULF STATES UTILITIES COMPANY
General Offices: Beaumont, Texas and Baton Rouge and Lake Charles, La.

rubber cushion, has been introduced to reduce this impact. Fluid passages have been enlarged since the advent of high velocity and large volume mud streams.

Drill pipe slips have been designed with longer gripping surfaces to handle greater lengths of pipe, and new one piece types have made their appearance.

Coring and Testing

Continuous development of testing, logging and coring tools for deep drilling has resulted in successful operations being taken at 15,000 feet.

The major changes in coring tools have been: (1) faster cutting soft formation cutter heads, due to more efficient flushing action; (2) faster cutting hard formation cutter heads with deeper and sharper teeth hard-faced to prolong useful life; (3) changed interiors giving larger cores with the same size cutter heads; (4) working barrels and core barrels long enough to take 30-foot cores; and (5) improvements in core catchers that have resulted in higher percentage recovery with more positive action.

A device has been introduced for the sampling of side-walls, and is used to take cores of formations indicated as being favorable by electrical surveys. The instrument, which is lowered into the hole on a cable, fires a bullet into the formation by means of a powder charge. The bullet is a hollow cylinder that collects the sample, and is extracted by wires attaching it to the gun section.

A great many refinements have been incorporated in formation testers, and these are assisting materially in the testing of zones encountered at deep levels.

The electric logging of wells, a common practice on deep operations, has kept pace with advancements with the introduction of additional resistivity curves. Several resistivity curves nowadays are measured by means of various measuring devices with the modern electrical survey instrument. The radius of investigation of these curves varies, so that the resistivity of the underground formation can be measured at a greater distance away from the center of the hole than formerly was the case. Such data is particularly beneficial in deeper wells, where layers are more apt to be invaded by drilling muds.

Pressure Control Equipment

Abnormal pressures encountered at 13,000-foot depths demand effective control if greater depths are to be reached. It appears that modern control apparatus can cope with the extremely high pressures of deep holes. Although it cannot be said that the ultimate has been reached in drilling control and blowout prevention equipment, it is certain that modern devices have reduced these hazards materially and have been instrumental in permitting today's deep drilling.

The drilling control equipment obtainable today is as positive and dependable as it has been possible to make, but drilling crews should be unremittingly schooled in its proper maintenance and operation.

The modern drilling-through valve does not interfere with any drilling operations.

Some of the control heads are designed to conserve space by inclusion of cross connections as a part of the unit.

A new cellar control gate introduced recently has been designed to withstand 10,000 pounds pressure per square inch.

Another new development is the gate closing steam engine, a mechanical device powered from the steam line that will shut the gate in a few seconds when a valve remote from the well is turned.

A drain hole has been provided in the bottom of some control gates, for eliminating difficulty with sand and shale lodging in the body of the gate and causing trouble.

New developments also have included combination drilling heads and rotating blowout preventers. These devices have been manufactured for 1500 pounds working pressure for drill pipe up to 4½ inches in diameter, but the manufacturer is contemplating the construction of a 3000-pound working pressure head with an 11-inch opening suitable for 6⅝-inch drill pipe.

Direction of Hole

A crooked hole may be a catastrophe at any depth, but at deeper levels becomes extremely undesirable. Consequently every effort is being made by operators to keep holes as near vertical as possible. Fishing jobs at excessive footages are arduous and expensive. Deflection survey instruments therefore are being refined with an eye to their use in ultra-deep wells of the future. Trends have been toward the design of units that will withstand the high temperatures encountered in the deeper holes and toward improvements in advanced recording devices.

Controlled directional drilling also is receiving wide application in deep wells, and devices for accomplishing this purpose have been advanced in keeping with the pace achieved in other specialties. Controlled directional drilling is finding applications in sidetracking junk, straightening the hole, and often for deflecting the bottom of the hole to more favorable locations. With deeper drilling and consequently greater investments per well, the application of controlled directional drilling assumes more significance in the search for petroleum; it offers possibilities of saving many holes.

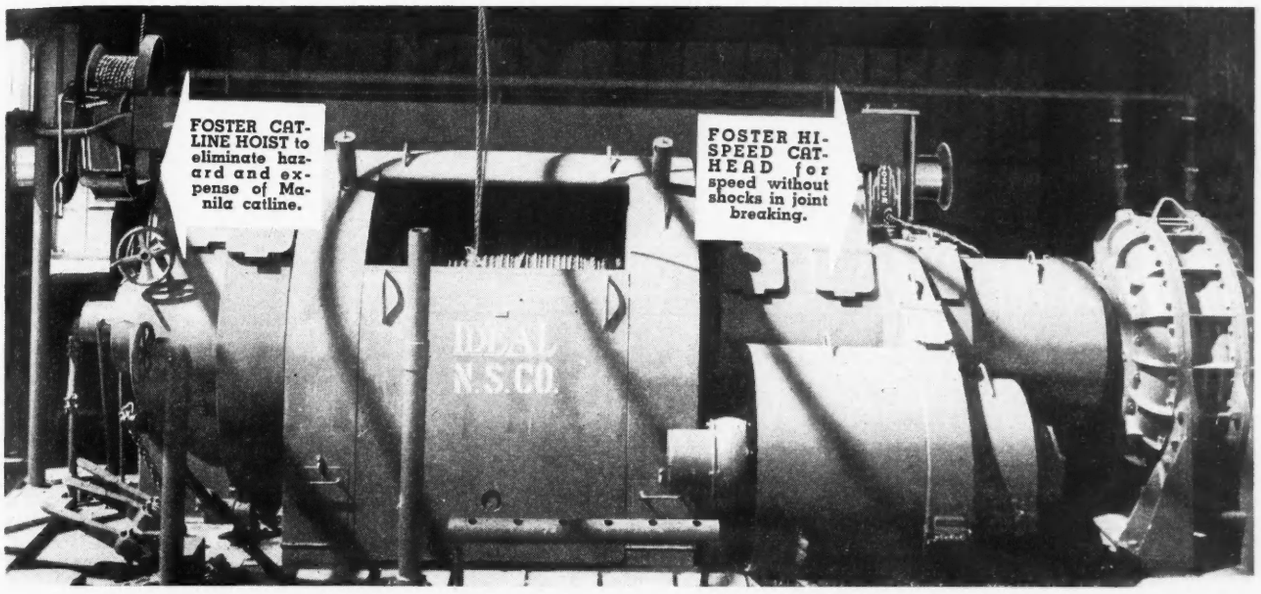
As wells are drilled deeper and deeper, temperature has become an increasingly important factor because of its higher levels. It has been demonstrated repeatedly that well temperatures definitely affect equipment. Excess heat is detrimental to leather packing, influences such items as drill pipe protectors. Heat often is a determining factor in the cement formula to be used in setting casing. Overheated rotary mud must be watched closely and tested repeatedly for viscosity and other qualities.

An instrument introduced recently will provide complete data on formation temperatures at all depths on only one run in the well. It is run on a small gasoline hoist by the regular temperature bomb crew, and accurately records on sensitized paper all temperature variations at any point in the hole. The unit can be used on either drilling or producing wells.

The matter of drilling to greater depths has been, and apparently will continue to be, a matter of refining the detailed construction of individual parts of machinery now in use. The various items will be strengthened as the need becomes apparent. Undoubtedly better materials will be used in order to keep down the weight and increase the strength. Deeper depths mean heavier loads and higher pressures, both of which increase the hazard to life. They will demand that more attention be given to safety features.

WORLD'S MOST POWERFUL DRILLING RIG

Sold by National Supply Co. to Superior Oil Co. for Deep Test in California


FOSTER CAT-LINE HOIST to eliminate hazard and expense of Manila catline.
FOSTER HI-SPEED CAT-HEAD for speed without shocks in joint breaking.
IDEAL
N.S.CO.

Rig Specifications: Five, 130 h. p. Boilers, 500 lbs. working pressure; 15 x 14 Twin Engine; 15½ x 9¼ x 22 pumps.

WHERE DEEPER DRILLING IS ANTICIPATED AND MORE POWERFUL RIGS ARE BUILT, FOSTER CATHEAD EQUIPMENT IS PREFERRED.

See this Foster Cathead equipment, Petroleum Exhibit, New York World's Fair.

For more detailed information, see pages 677-79 of 1939 Composite Catalog, or write Foster Cathead Company, Wichita Falls, Texas.

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WORLD DEVELOPMENT and TECHNOLOGY

Edited by
WM. V. GROSS, Associate Editor

Notes on Mexico

Mexican expropriation conferences continue without announcements of progress . . . Suarez called to task on verity of statements . . . Value of peso lower

Conferences between representatives of oil companies whose properties in Mexico were expropriated March 18, 1938, and those of the Mexican government continue without announcement of any substantial progress toward a mutually satisfactory settlement.

The properties, valued at $400,000,000 were taken over by the Cardenas administration for failure of the companies to meet demands of labor when ordered to do so by Mexican authorities. The companies claimed that to have met the demands would have bankrupted them.

Business Worse

Meanwhile, business conditions in Mexico have grown steadily worse since the government took over operation of the oil industry there. Under private management the industry was one of the heaviest contributors to the federal coffers. Labor conditions, too, have been far from smooth in a number of industries, including oil.

Eduardo Suarez, secretary of finance and public credit who has been issuing statements attempting to justify expropriation and other acts said by him to be essential to Mexico's economic and social reform program as sponsored by the Cardenas regime, has been called to task by the Mexican Institute of Economic and Social Studies, which alleges him to have made several serious errors of fact.

Peso Drops Lower

The institute charges Suarez's statement that Mexico is on the road to recovery does not dovetail with the facts. It challenges the truth of his statement that foreign countries, including the United States, have admitted Mexico to be in the right in her manner of expropriation. In the face of a statement from Suarez that the Bank of Mexico has increased its reserves by 12,000,000 pesos, the institute flings the bank's own statement to prove that the bank's reserves actually have decreased by nearly 14,000,000 pesos.

Meanwhile, the value of the Mexican peso has continued to dwindle, street vendors receiving six pesos for a dollar. Bank quotations on the peso during a recent week ranged from 5.80, opening sales at the bank on a Monday morning, to 5.97 pesos for a dollar Friday afternoon. Just prior to expropriation of the oil industry the peso had been fairly stable for some time at 3.60 to the dollar. Decreased purchase of silver from Mexico by the United States treasury is said to be partly responsible for the devaluation.

Silver Purchases

While it is not considered likely the Washington government will take immediate official legislative action to block purchases of Mexican silver, such a move is a future possibility. But it is not likely to be applied until all legal steps directed at return of or just compensation for the the expropriated properties have been exhausted. Some Mexican business men, however, fear the consequences of such action.

"If the treasury of the United States ceases to purchase Mexican silver, the mining industry will be faced with catastrophe," according to a recent statement of Ing. J. Sanchez Mejorada. "The bulk of railway shipments are products of the mining industry and, should this important business suffer any setback, railway costs would increase to the detriment of all humanity," he said.

It is generally felt the oil companies and the government are about as far apart as possible on their respective conceptions of what would constitute fair and just compensation for the oil properties. The idea of obtaining prompt compensation has just about flown.

Will Pay in 10 Years

President Cardenas issued a statement in Tiajuana in July stating that 20 percent of all foreign sales of Mexican crude were being set aside to pay the foreign controlled companies for expropriated properties; that they would be paid for within 10 years. One man points out, assuming that the republic could produce 40,000,000 barrels per year and export all of it, 20 percent of this amount would be 8,000,000 barrels. Assume further that the oil brought a dollar per barrel in U. S. money. This would represent a payment of 2 percent per annum on the $400,000,000 valuation placed on the expropriated properties.

The Syndicate of Mexican Petroleum Workers is attempting to unify its forces and settle sectional dissensions. A statement issued by it says: "We are the guardians of the country's currently most salable resources. We are standard bearers of labor in the revolutionary campaign that demands intervention of the worker in industrial management as a guarantee of efficiency, social justice and fair distribution of increment, and we are aware of our responsibility. It follows then that we are above permitting the intervention of personal prejudice and suspicion into management of our organization."

Tampico Not Satisfied

Apparently the important Tampico section of the union does not agree with the last sentence of the above statement, for it has already resolved to form a separate, independent labor organization, primarily because of dissatisfaction with labor executives appointed by Mexico City headquarters.

On top of this, the Vera Cruz Confederation of Workers, a C.T.M. affiliate, has complained that both workers' and employers' interests suffer at the hands of the Vera Cruz labor board because of negligence and confusion.

The situation is not without its pathetically humorous aspects. Petroleos Mexicanos, the government organization which took over management of the oil industry after the expropriation act, tells the world everything is running with smooth efficiency. Yet recently when workers complained because the old wage increase demands had not been met, even under government operation, a spokesman for the management is quoted as saying Petroleos Mexicanos is bankrupt.

Some Want Return

Novedades, a Mexico City newspaper, declared some of the workers have expressed a desire that the properties be returned to American and British oil companies. Those workers claimed they were no longer able to put up with the oppression of their own comrades who have become powerful overnight.

The government company, which has been most proficient at issuing statements for public consumption, lately has declared on several occasions that the problems of distribution have been solved. Yet El Siglo de Torreon, a Coahuila state newspaper bemoans

complete exhaustion of gasoline supplies. Shortly after this, Jesus Silva Herzog, general manager of Distribuidora de Petroleos Mexicanos, and Salvador Romero, general manager of National Railways, signed a joint statement saying important measures have been adopted to prevent shortages of gasoline and fuel oil such as occurred recently in Saltillo and Zacatecas.

Australia may start large tank construction program

Possibility of a tank construction program involving an expenditure of $65,000,000 is seen in a report of a committee of scientists, business men and departmental officers to Victoria, Australia's commonwealth minister for supply. The committee also rejected the proposal of production of oil from lignite and grain or grapes as being too expensive.

Lacey C. Zapf, United States trade commissioner at Sydney, furnishes the following information on the contemplated storage construction program:

Late in 1938 the federal government appointed a standing committee of scientists, business men and departmental officers to survey the whole field of production and storage of liquid fuels in Australia and investigate sources capable of developments.

In a report recently submitted to the commonwealth minister for supply this committee has estimated that to provide storage for a year's supply of petrol — 300,000,000 gallons — Australia would have to make a capital expenditure of about £13,000,000 ($65,000,000 U. S.). Nevertheless the committee favors this proposal, and quotes the figure of £13,000,000 as an argument against production of oil from coal or crops.

Storage Less Vulnerable

"The cost of a plant capable of producing only 45,000,000 gallons of petrol a year from brown or black coals by hydrogenation would be between £11,000,000 and £12,000,000" says the committee. "Storage would have the additional advantage of being less vulnerable than a concentrated extraction plant.

"Petrol could not be produced from Yallourn (Victoria) lignite at less than three times the price of imported petrol. If the industry produced 18,000,000 gallons a year and employed 600 men it would involve a cost of £750,000 a year or £1250 a man."

In rejecting proposals for the production of petrol from grain or grapes the committee says: "Molasses is the most economic source of power alcohol among the products of rural industry, but, even if produced from this material, the spirit would cost four times as much as imported petrol."

Benzol Problem

In order to make Australia more self-reliant on oil supplies, this standing committee also investigated the production of benzol from town gas. Tests concluded indicate that a capital cost of £500,000, between 2,000,000 and 3,000,000 gallons of benzol a year could be produced from coal gas manufactured in Melbourne and Sydney. It is probable that experiments will be continued.

The benzol is obtained by "scrubbing" after the separation of water from the gas in refining processes. This process, it was found, reduced the calorific value of the gas, and before it could be made a general practice, special legislation would have to be passed in one state, so that the gas would comply with legal standards.

In Appendix No. 1 details of imports of fuel oils into Australia during the March quarter, 1939, compared with those of the like quarter of 1938, are shown.

Imports of petroleum and shale spirit increased from 80,665,143 gallons in the March quarter, 1938, to 96,600,675 gallons in the like quarter of 1939, The Netherlands East Indies supplying over 17,500,000 gallons of the increase.

Imports of crude petroleum decreased from 16,144,895 gallons in the March quarter of 1938 to 10,444,410 gallons in the corresponding period of 1939, imports from both The Netherlands East Indies and Persia showing appreciable decreases. The movement in lubricating oil was not very great.

Total imports of kerosene during the 1939 March quarter amounted to 15,202,124 gallons compared with 12,440,754 gallons in the corresponding quarter of 1938. Imports of 3,359,512 gallons were made from the Bahrein Islands. Imports from the United States decreased from 1,604,121 gallons in the 1938 quarter to 277,432 gallons in the like quarter of 1939.

Geologists busy on Shell concession in Guatemala

Geophysicists have completed a gravimetric reconnaissance and an aerial survey of 47,664 square kilometers has been made on the Guatemalan concession of Compania Guatemalteca de Petroleo Shell, but the geologists and geophysicists are still working at selection of a first drill location.

An official statement by the Hague office of the Shell, follows:

"Although Guatemala is adjacent to Mexico, where rich oil fields have been developed, no serious exploration for oil was undertaken before 1938. The lack of encouraging oil seepages and the inaccessibility of certain districts prevented the big oil companies for a long time from taking an interest in the country, in view of the enormous expense which exploration would entail.

"In 1899 a Geological Map of Guatemala and the adjoining countries was published by the well-known Professor K. Sapper, who had done an immense amount of pioneer geological work. Since that time our knowledge of the geology of Guatemala has not been materially improved. From time to time oil companies sent their geologists to the country; these activities were restricted, however, to short geological reconnaissances.

"In 1938 systematic geological exploration work was started for the first time by the Compania Guatemalteca de Petroleo Shell, to which a concession had been granted covering a large part of northern Guatemala. In view of the fact that there was no good map of this part of the country, the company decided to have the area in question mapped by the most up-to-date topographical method, aerial survey; 3768 air photographs were taken, covering an area of 47,664 square kilometers (the whole area of Guatemala being 109,725 square kilometers). On the basis of these photographs the local staff of the company prepared topographical sheets on a scale of 1:40,000 and 1:100,000.

"A staff of field geologists and a palaeontologist are entrusted with the geological field work and with the photo-geological interpretation of the aerial photographs, while geophysicists have carried out a gravimetric reconnaissance. The studies are still in progress."

California company will not develop Home holdings

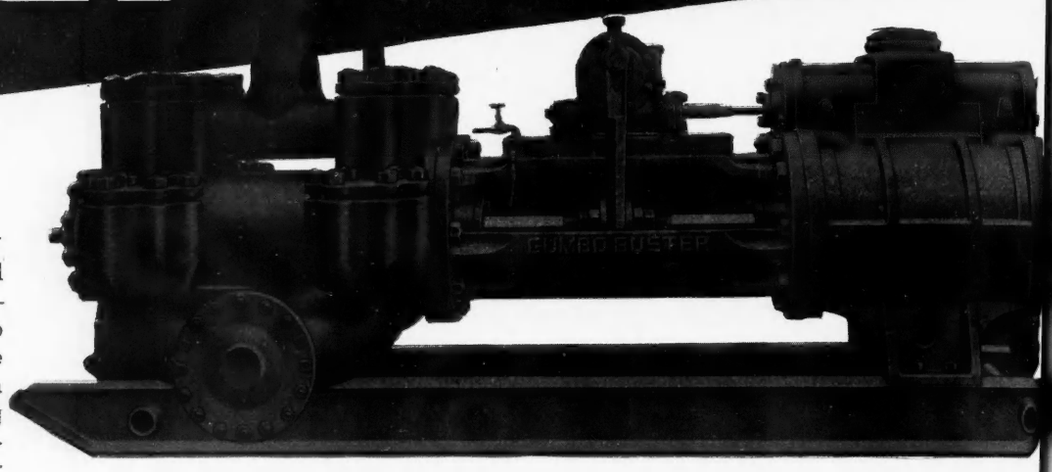
Negotiations looking toward development of north Turner Valley acreage of Home Oil Company by Standard Oil Company of California have been suspended, it was announced last week. They had been opened shortly after completion several months ago of Home Oil Company's Millarville 2, which furnished a 15-mile extension to the crude oil producing area of Turner Valley and is currently the largest well in Canada. The development was to be undertaken by The California Company, subsidiary of the Standard company.

"By mutual agreement, the negotiations between your company and the Standard Oil Company of California for the development of your north Turner Valley acreage and the handling of your oil products have been suspended during the present year," R. H. B. Ker, president of the Home company, formally reported to stockholders. "Since the Standard Oil Company of California has not completed arrangements in Alberta for refining and marketing of your oil products, the completion of the agreement would be of little value to either company."

The announcement does not mean withdrawal of The California Company from the Alberta oil development picture, as the company is currently conducting preliminary surveys on several structures and holds acreage in scattered sections of the province. The Home company, meanwhile, is undertaking development of acreage surrounding its Millarville 2 well, but at a slower rate than would have been possible had negotiations with The California Company been completed.

Ten miles northwest of Home's Millarville 2 well, Mar Jon Oil Company had rig up for a test on Whiskey Creek anticline. The structure is between Waite Valley and the north end of Turner Valley. The location is 2 miles west of the Outwest fault and east of the Waite Valley fault, the structure being a south continuation of Two Pine anticline. Drilling will start in the Cardium sandstone, and the Madison lime should be encountered at approximately 5000 feet. In view of activity on the Waite Valley structure and the highly successful completion of the Home company's test in north Turner Valley, the Mar Jon company wildcat will be closely watched. In the opinion of many geologists, a large area north and west of the Home company's well, and extending to Waite Valley, is highly favorable for crude in the Madison lime.

DEEP DRILLING EQUIPMENT



Gumbo Buster Rotary Drilling Machinery has earned an enviable reputation for efficiency and economy in deep drilling. As holes have gone deeper and deeper it has been built to meet each succeeding requirement — has been time-proven in progressively deeper and harder service for over 40 years. It had to be good to maintain its recognized leadership.

Characteristic of Gumbo Buster deep drilling equipment is the big "K-Steam Slush Pump, illustrated here.

★ **Power A-Plenty:** This Pump requires less steam to handle a greater fluid load than any Steam Pump of comparable size. With 16" diameter Steam Cylinders for enormous fluid pressures, 8½" diameter Fluid Liners for plenty of volume, and a full 20" stroke that reduces piston speed and saves repair bills, the "K-20" can be depended upon to operate efficiently and economically under the highest steam and fluid pressures encountered in present-day deep drilling.

★ **Fluid End:** Alloy cast electric steel, the four parts electrically welded into one piece—lighter than cast iron, much stronger, and can be welded should the need arise. Extra large (6½" diameter) opening through the valve permits ample flow with low velocity. Extremely short lift minimizes valve hammering and increases life of all related parts. Side and end suctions.

★ **Steam End:** Designed with extra large and lon piston valves placed close to cylinders, pe mitting use of straight and short ports and corre pondingly reducing amount of steam used. Ports ar plenty large for the steam to enter and escape fro the cylinders with a minimum of friction and bac pressure—no "short stroking" with this Pump.

★ **Rocker Shaft Housing:** Rack and Pinion Typ Piston Valve Operating Mechanism is com pletely enclosed in an oil-tight housing and operate in a bath of oil. Alloy steel Rocker Arm Shafts ar mounted on Roller Bearings.

★ **Light Weight:** Skeleton design and steel flui end makes this big Pump considerably lighte even than its nearest smaller sized competitor. weighs only 18,000 pounds.

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MEN IN THE INDUSTRY'S NEWS

E. D. SMITH PROMOTED TO ASSISTANT MANAGER IN CHARGE OF DRILLING AND PRODUCTION FOR MAGNOLIA PETROLEUM

E. N. WILSON IS MADE GENERAL SUPERINTENDENT AND OTHER PROMOTIONS ARE ANNOUNCED

E. D. SMITH general superintendent of the producing department of Magnolia Petroleum Company, Dallas, has been promoted to assistant manager in charge of drilling and production, according to D. A. Little, president. Smith succeeds Charles L. Gladden, who resigned to become associated with a drilling contracting firm. Smith is a veteran employe, having served as Oklahoma division superintendent for a number of years prior to being transferred to the Dallas headquarters on March 1, 1937.

E. N. Wilson, who has been superintendent of the Oklahoma division, will move from Oklahoma City to Dallas to relieve Smith as general superintendent. A. H. Proctor, field superintendent in the Stonewall district, Oklahoma, has been appointed successor to Wilson at Oklahoma City.

Other changes in personnel include the appontment of George Miller, manager of the distribution department to acting manager of the marketing division while Fred M. Lege, Jr., is on sick leave. Earl A. Brown, member of the company's Oklahoma City legal staff, has been appointed an assistant general counsel, and will establish headquarters at Dallas.

E. D. SMITH

CLINT W. MURCHISON, vice president of American-Liberty Oil Company, Dallas, spent the past week in New York on a combination business and pleasure mission.

JOHN H. LANGSTON, chief scout for Sun Oil Company, Dallas, accompanied by his family, spent the past week vacationing in Florida.

JULIAN L. FOSTER, general superintendent and chief engineer of the Lone Star Gas Company, Dallas, has journeyed to Galveston with his family for a vacation that will be long on rest and sunshine.

IRA A. BRINKERHOFF has been transferred by Stanolind Oil & Gas Company from San Antonio to Houston, where he will assume the duties of Gulf Coast district geologist.

W. T. GRANT has been appointed assistant chief safety engineer of Humble Oil & Refining Company. Before the promotion Grant was chief safety engineer in the company's refining department and was stationed at Baytown, Texas.

FRANK H. KELLEY, Colorado City district land man for the Magnolia Petroleum Company, was elected temporary chairman of the Permian Basin Oil, Land and Business Men's Association as a preliminary move towards perfecting a permanent organization by representatives of 15 West Texas cities and towns. The first meeting was held July 26 at Colorado City.

JOHN MURRAY, of Alice, has established Texas headquarters at that place for Amory Oil Corporation, a Delaware concern which has its principal offices in Boston, Massachusetts.

T. W. WILLSON, for a number of years connected with the San Antonio district of the Texas Railroad Commission, and who has been in Abilene for several years, has been transferred back to San Antonio. He was in the proration office in charge of Darst Creek field during the early days of that area's development. Later, he was in the San Antonio office, then in the Refugio office.

IRA BRINKERHOFF, for several years in the geological department of Stanolind Oil & Gas Company in San Antonio, has been transferred to Houston to become district geologist for the Texas Gulf Coast region. Prior to coming to San Antonio, he was geologist for Sinclair Prairie Oil & Gas Company in Corpus Christi.

GEORGE COLLOM, of Corpus Christi, was in San Antonio several days in connection with completion of plans for the drilling of a Sparta-Wilcox test in southern Wilson County.

JERRY RICE, in charge of Camp Drilling Company's operations in Corpus Christi area, is back from a vacation in California.

W. F. STEWART, Duval County, Texas, independent operator, was in Houston last week.

CHESTER NARAMORE, secretary of the petroleum division of the American Institute of Mining and Metallurgical Engineers, recently was in Los Angeles studying local problems and laying plans for the regular fall meeting of the institute.

J. R. PEMBERTON, oil umpire for the Central Committee of California Oil Producers, is putting the finishing touches to the annual statistical review covering the California petroleum industry.

DR. SYLVAIN J. PIRSON, head of Petroleum and Natural Gas Department, Pennsylvania State College, is in Tulsa as technical adviser in the installation of geochemical survey equipment for Geochemical Service Corporation.

E. C. EDWARD, Los Angeles, and A. F. Barrett, Casper, arrived in Calgary last week to establish an office for General Petroleum Corporation, subsidiary of Socony-Vacuum Oil Company. Edward explained that he and Barrett were merely delegated to look over activity in Alberta.

M. M. TRAVIS, E. M. Travis and Arnold M. Travis have organized M. M. Travis, Inc., as a Texas corporation with headquarters at Kilgore.

JACK PADDLEFORD, of the Kansas geological staff of Stanolind Oil & Gas Company, has returned to Wichita after taking a quick trip to the Colorado mountains where he left his family for a two-month vacation.

W. F. CLINGER, president of Clinger Oil & Gas Company, Tidioute, and vice president of Superior Oil Works, Warren, was reelected president of the Pennsylvania Grade Crude Oil Association when directors held their annual meeting at Oil City last week.

Other officers named are Parker L. Melvin, Towne-Melvin Oil Company, Bradford, and Otto Walchli, Richardson Petroleum Corporation, Wellsville, New York, vice presidents; John A. Beck, Pennsylvania Refining Company, Karns City, recording secretary; S. Messer, Quaker State Oil Refining Corporation, Oil City, treasurer; W. R. Reitz, Quaker State Oil Refining Corporation, Oil City, assistant treasurer; J. E. Moorhead, Oil City, executive secretary; S. A. Hartwell, Jr., Oil City, assistant secretary, and Fayette B. Dow, Washington, D. C., general counsel.

E. S. TAXMAN, H. Siegel and A. W. Siegel last week organized Taxman Oil Company as an Illinois corporation with headquarters in the State Bank Building, Rock Island.

A. D. HOVEY has been named secretary-treasurer of the Petroleum Association of Illinois, which last week moved its offices from Centralia to the Oil Exchange Building in Flora. He succeeds Ernest T. Egan, who resigned to resume his former duties as manager of the Centralia chamber of commerce.

W. C. FISHER, Calgary, president and managing director, heads directors of

Model Oils, Ltd., Alberta operating company, who were reelected at the annual meeting of the company last week in Calgary. Other directors named are W. R. MacArthur, Winnipeg, vice president; T. W. McKee, Calgary, secretary-treasurer, C. W. Barber, Cheadle, and Harry Groves, Strathmore.

W. D. FLEMING, Nora Kepley and J. K. Kepley are principals of the Texas Atlas Petroleum Corporation which was organized under Texas laws last week. Headquarters are in Corpus Christi.

M. C. LEVERETT of Humble Oil & Refining Company will address the Gulf Coast division of the A.I.M.M.E. at Houston on August 1 on "Studies of the Flow of Fluids in Sands."

H. ROUW, Edinburg, and several other Rio Grande Valley business men have formed a new oil company to operate in that area. Rouw is president of Packer Petroleum Company. Other officials are T. E. Stephens, Edinburg, vice president; D. R. Givens, Weslaco, secretary; J. R. Paxton, Mercedes, director. The company is starting a wildcat in Starr County.

JAW W. NELSON, Oklahoma oil operator, is touring Michigan oil fields.

L. S. SINCLAIR, vice president of Magnolia Petroleum Company, is recuperating at Baylor Hospital, Dallas, following an emergency appendectomy July 23. He was stricken while on a week-end fishing trip in East Texas.

MELVIN CAMPBELL, land department assistant for Sun Oil Company, Dallas, departed late last week, accompanied by his family, for a vacation on the Texas Coast.

Missouri-Kansas Pipe Line loses federal court tilt

Missouri-Kansas Pipe Line Company lost its effort to halt Federal District Judge John P. Nields, of Wilmington, Delaware, from determining whether he will allow Columbia Oil & Gasoline Corporation, an affiliate of Columbia Gas & Electric Corporation, to regain control of Panhandle Eastern Pipe Line Company when the United States Circuit Court of Appeals at Philadelphia denied its request to stay all proceedings. The Missouri-Kansas company sought to have the Wilmington court proceedings stayed pending an appeal taken from Judge Nields' refusal to allow the company to intervene and object to return of securities to the Columbia company.

Reassignment of the stock, now held by a federal court trustee in an anti-trust suit filed by the government against the two Columbia companies in 1935, is part of a plan to carry out a decree entered by Judge Nields early in 1936 that the Columbia companies cease illegal restraint of competition practices against the Panhandle company. The Missouri-Kansas company built the Panhandle and is a minority stockholder therein.

WALACE E. HAWKINS has been appointed General Counsel of Magnolia Petroleum Company and Magnolia Pipe Line Company, it was announced July 24 by D. A. Little, president of the companies. Hawkins has been a member of the legal department of the two companies since February 15, 1925.

A native Texan, Hawkins was born at Brookhaven, Bell County, July 24, 1896. Elected to the Legislature from Runnels County in 1916, he resigned the next year to enter the First Officers' Training Camp at Leon Springs. Given a commission as Second Lieutenant at the conclusion of camp, he remained in active service until the end of the World War, retiring as a captain.

Graduating from the Law School of the University of Texas in 1920, Hawkins served as assistant attorney general from 1921 to 1924. Following his resignation as assistant attorney general, he engaged in the private practice of law in Houston, until his association with the Magnolia companies in 1925.

WALACE E. HAWKINS

"Mr. Hawkins' wide experience in his profession and his more than fourteen years of service in our Legal Department well fits him for the position he now assumes as General Counsel of our companies," Little said, "and we are confident he will fill his newer assignment with credit to himself and satisfaction to the Magnolia companies."

D. E. BUCHANAN, Tulsa, was a Corpus Christi visitor last week. Hanlon-Buchanan, Inc., has a large blending plant on the Corpus Christi channel.

BRUCE BAXTER, vice president of Sal Viejo Oil Corporation, of Corpus Christi, is vacationing in Mexico City.

H. C. WALLACE, New York, chief engineer for West Virginia Gas Corporation, is inspecting the company's producing properties in the North Pettus field in Goliad, Karnes and Bee counties.

JOHN E. MULLIGAN, scout for Magnolia Petroleum Company in the Illinois Basin, with headquarters at Mattoon, spent the past week vacationing at Wichita Falls, where he formerly resided, and other points in Texas.

DIED:

WILLIAM STEWART HERRON, 69, president and managing director of Okalta Oils, Ltd., large West Canadian holding and operating company, died at his home July 21 following a heart attack suffered several weeks previously on the derrick floor of his company's No. 8 well in Turner Valley. All Alberta drilling rigs stopped for three minutes, starting at 2 p.m. July 24, while funeral services for the pioneer oil man commenced at Calgary.

Herron was convinced of oil and gas possibilities of Alberta long before drilling of the discovery well in Turner Valley in 1913. He was instrumental in organizing the Calgary Petroleum Products Company, driller of the first naphtha well. The company was later absorbed by Royalite Oil Company, Ltd., subsidiary of Imperial Oil Company, Ltd., He organized the Okalta company in 1925, and the firm in recent years has been active in Turner Valley.

L. E. ERWIN, 56, foreman in the Lucien district for Sinclair Prairie Oil Company, died July 18 at Albuquerque, New Mexico, after a prolonged illness. He had been with the company since 1919. Burial was at Covington, Oklahoma.

JOHN McCAFFARY, 67, president of Madison Oil Company and associated with the West Canadian oil industry for the past eight years, died at his home in Calgary, Alberta, July 24.

HARVEY M. JAMESON, 36, oil well driller at the Ray Johnson well, 15 miles south of Grayville, Illinois, died July 18, as the result of injuries suffered in the explosion of an oil tank on the lease.

EARL W. THOMPKINS, engineer for Denver Producing & Refining Company, was electrocuted July 27 while making connections for pumping equipment in the St. Louis field, Semniole area, Oklahoma. He had been with the concern but one month, coming from Seguin, Texas. His body was forwarded to Homer, Louisiana, his home.

JAMES W. FINLEY, former general counsel for Cities Service Oil Company, Bartlesville, was killed in an automobile accident July 26 near Longmont, Colorado. Since retirement three years ago he had lived in Denver. His wife was critically injured in the accident.

JESSIE J. JENKINS, Jr., 25, vice president of Jenkins Drilling Company, Kilgore, Texas, was fatally injured July 23 when his auto crashed into a bridge abutment on the Kilgore-Longview highway. He was en route a family gathering at his father's ranch near Greenville.

R. B. MAGEE, 62, independent operator, died July 21 in a hospital at Fort Worth. He formerly lived at Wichita Falls.

THE WEEK'S NEWS SUMMARIZED

Federal Control

The possibility of federal control for the oil industry loomed strongly on the horizon last week, as a bill providing for such regulation was introduced in the House and when President Roosevelt urged the adoption of such a measure.

Administration of the proposed act would be in the Department of Interior, as a petroleum conservation office under the direction of a commissioner would be created in this governmental division. A full investigation of waste in all oil and gas fields would be conducted, and if avoidable waste was found to be occurring, federal steps would be taken to stop the wasteful practices.

No action is expected on the bill at this session of Congress, but it is expected to be one of the important considerations when Congress convenes again.

Allowables

The probable future course of proration in the East Texas field was further confused the past week as (1) the commission proposed that allowables be "adjusted" on an acreage basis by the larger holders drilling more wells; (2) Humble Oil & Refining Company filed suit to force the commission to adjust its allowable to its proportionate share of the acreage; and (3) scheduling of a hearing on the Humble case by the commission for August 15.

These developments grew out of the famous Rowan & Nichols case, in which a federal court granted the concern higher allowables on the ground that a disparity in acreage between a neighboring tract was creating inequitable allowables in the instance involved. Several other firms, besides Humble, filed petitions requesting the commission to comply with the court ruling, but these were ignored until last week.

The Humble situation is of vast importance. The adjustment in Rowan & Nichols' allowable made little difference in the aggregate production of the field, but because of Humble's large holding a similar adjustment would make a big change, and probably would force other large acreage holders to file similar suits.

In California, the Atkinson state oil control measure became a law when Governor Olson put his name on the passed act, which is to become effective within 90 days. Meanwhile, two referendum petitions designed to repeal the bill have been filed with the attorney general's office.

The first legal attack on Michigan's 1939 oil conservation act entered the courts last week, when a group of Kent County land-royalty owners and a development company sought to enjoin the commissioner from enforcing acreage proration on certain wells in the Walker field.

Louisiana Scandal

The probe into a possible Louisiana oil industry scandal by the federal government was intensified last week, as additional investigators arrived and as a federal grand jury commenced taking of testimony. Meanwhile there was another shift in Louisiana Conservation Department, as William G. Rankin was removed as its head and as Dr. J. A. Shaw was reinstated as head of the mineral divisions of the department after being removed three weeks ago.

Trust Victory

A major victory for the oil industry in the "first" Madison trust suit occurred when the U. S. District Court of Appeals at Chicago reversed a conviction of 12 major companies and 5 individuals one year ago. Four reasons were given for the court's decision and remanding of the case for retrial: (1) the question was reasonableness of restrictions on interstate commerce and not anti-trust law violations; (2) under the government's theory that the anti-trust laws had been violated it was not a jury issue; (3) efforts of the government during NRA to stabilize the prices of crude oil and gasoline should have been considered by the jury to determine the good faith of the defendants in removing surplus gasoline from the spot market; and (4) venue of the prosecution was improperly laid.

Findings of the Chicago court are of inestimable value to the oil companies, as they upheld contentions of defense counsel that had been vigorously but unsuccessfully championed from the start of the trial. The government plans to appeal the case to the U. S. Supreme Court.

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Oil at the Capitols

Introduce new control bill calling for federal regulation in areas where states permit avoidable waste . . . President Roosevelt backs proposed act

Cole puts federal control bill before representatives

In a new move to achieve the long-desired federal control of the oil industry, President Roosevelt on July 26 had introduced in the House of Representatives by Congressman William P. Cole, Jr., (Dem., Maryland) legislation under which the Interior Department would have full control of the development of oil fields and the production of crude oil and natural gas.

The measure, prepared in the Interior Department, was laid before Chairman Clarence F. Lea (Dem., California) of the House Interstate and Foreign Commerce Committee and Mr. Cole, chairman of the Oil Subcommittee, by President Roosevelt and Secretary Harold L. Ickes at a White House conference July 20, with an explanation that its introduction was desired in order that a study of the situation might be made during the recess of Congress and the measure perfected for action early next year.

Later, in a letter to Chairman Lea, the president stressed the need for legislation which will "provide a coordinated national policy of oil conservation" and prevent avoidable waste in production.

"As you know," the president wrote, "despite the progress which has been made toward oil conservation under state law and regulation, the production of petroleum is attended by waste. In view of the vital part which petroleum plays in the national defense as well as its importance in commerce and industry, the prevention of waste in petroleum production should be made the subject of an enactment by Congress.

"I appreciate the thoroughness with which the Committee on Interstate and Foreign Commerce conducted the petroleum investigation in 1934," he continued, "but in the light of changes that have taken place, I believe the committee may wish to study developments since that time by investigations and hearings prior to the next session of Congress. To this end, and with a view to the enactment of suitable legislation in the next session, I request that the petroleum conservation bill which I today discussed with you and Representative Cole be introduced at this session."

Cole Explains Function

In introducing the bill, Representative Cole explained that under it an office of petroleum conservation would be established in the Interior Department, to be headed by a commissioner, and that pertinent oil activities of the federal government would be consolidated in that office.

"The commissioner is authorized to investigate and determine if oil or gas is produced wastefully in any field in the United States," he said. "If investigation develops that waste does not occur, notice to that effect will be given to state officials, operating companies and the public. If waste is found to occur, as determined in accordance with standards established in the bill, findings to that effect will be revealed and regulations issued to provide for the elimination of such waste. State officials and operating companies will be properly notified of such findings and full opportunity given for correction. If waste is not found or if corrected, the commissioner will take no further action.

"When waste has been found to occur and corrective measures as set forth in the regulations have not been applied, the commissioner is authorized to institute legal action to compel the prevention of waste and, in addition, the Connally Act, as amended, is broadened so that transportation in interstate commerce of oil produced wastefully also is prohibited.

"The bill intends to develop fullest possible cooperation between state and federal officials and the oil industry in the prevention of waste. To this end a Council on Petroleum Conservation is established.

"The bill is designed solely as an oil and gas conservation measure and does not attempt to control supply through the establishment of production, marketing or transportation quotas; does not affect imports or exports of petroleum, and does not provide for any coordinated industrial action in refining and marketing."

Purposes of Act

Back of the legislation is seen the administration's concern over the Louisiana situation and an adequate supply of oil for military purposes in the event of war. The measure is based on the authority granted by the constitution to the Congress to maintain an adequate national defense and to regulate commerce between the states, and those purposes are set forth in the "findings and declaration of policy," which are a preamble to the bill, as follows:

"The Congress hereby finds that in the production and storage of petroleum from deposits situated within the United States, the employment of methods and practices which are wasteful of petroleum and of the reservoir energy available for the recovery thereof from such deposits (1) is inimical to the maintenance of reserves of petroleum, and of the facilities for the recovery and transportation thereof available for military and supporting civilian needs in an adequate national defense; (2) burdens and obstructs interstate commerce and causes harmful diversion of such commerce; (3) if not controlled will further and increasingly burden and obstruct interstate commerce and will unduly limit the usefulness of instruments of transportation and causes the abandonment of facilities for such commerce; (4) causes interstate commerce to be the means of encouraging such wasteful methods and practices; and (5) constitutes an unfair method of competition in interstate commerce.

"It is hereby declared to be the policy of Congress, through the exercise in this act to provide for the maintenance of an adequate national defense and to regulate interstate commerce, to further the conservation of petroleum by the elimination of the wasteful methods and practices above referred to insofar as such methods and practices may be avoidable and to encourage and assist the various states in their efforts to prevent the waste of petroleum."

Purely Administration's Baby

In submitting the bill to the House, Congressman Cole made it clear that the proposal was purely the administration's "baby," and indicated reluctance on the part of himself and his committee to undertake a program so near to nationalization of the oil industry.

"This bill was not prepared by me or any member of the subcommittee over which I presided as chairman in 1934 during the investigation of the petroleum industry and which has handled all legislation on the subject of petroleum referred to the Interstate and Foreign Commerce Committee since that time," he said.

"It is the idea of the president of the United States that the investigation conducted by our committee in 1934 be brought up to date during the interim between the adjournment of the present session of Congress and next January 1. After a long and hard session, the members of the subcommittee hesitate to undertake a job of this magnitude, but due to the fact that it was felt we could bring the investigation to date more expeditiously than at first thought, I assured the president that after introduction of the bill by me, at his request, I would with the consent of this Congress and after consultation of the subcommittee and Chairman Lea of the full committee, undertake that study."

To enable the investigation to be undertaken during the recess, a resolution granting the consent of Congress to the study and providing such funds, if any, as may be deemed necessary for expenses will be submitted within a few days.

Based on the recommendations made by the National Resources Committee last winter, the measure provides for "cooperation" with the states only to the extent that the state authorities will be given an opportunity to eliminate wasteful operations which may be found before the federal government resorts to legal action to enforce its demands.

To the extent that the federal government would have authority to regulate the development of oil fields and the production of oil and gas, the measure conforms with the desires of Secretary Ickes as expressed in legislation unsuccessfully pressed following invalidation of the oil code and the NRA. Al-

though he ceased to urge such measures following enactment of the original Connally Act and adoption of the Interstate Oil Compact, the secretary has never changed his opinion that successful conservation could be achieved only under federal auspices.

As an example to the states of what could be done to achieve conservation, Secretary Ickes has adopted the unit plan of development for new pools and fields in the public lands and in other ways has attempted to put his precepts into effect.

Louisiana Hinted as Cause

The Louisiana scandal, which it has been hinted in administration circles has all the ramifications of another "Teapot Dome," is said to have precipitated reconsideration of the administration's attitude on oil conservation. The "hot" oil situation in that state, complained of for the past two years or more, is said to be an important feature of the Department of Justice probe, which includes also mail frauds, income tax evasions and WPA irregularities.

The apparent failure of the Louisiana authorities to curb production within the state, together with representations of army and navy high officials of a possible oil shortage in the event of an emergency unless steps were taken to protect our reserves, were said to have influenced the president to request the legislation.

Under the measure, the office of petroleum conservation would be under the direction of a commissioner appointed by the president and two associate commissioners to be appointed by the secretary of the interior.

Commissioner's Job

The measure would give the commissioner authority to investigate petroleum production in every field in the United States to determine whether there is avoidable physical waste of crude oil and the avoidable waste of reservoir energy available for the recovery of crude oil. In making this determination the commissioner shall consider:

1. The porosity, permeability and other characteristics of the deposit or deposits;
2. The nature and character of reservoir energy;
3. Well spacing, drilling practices, well casing and well completion;
4. The rate of decline in reservoir pressure per unit of crude oil produced;
5. The ratio of natural gas production to the amount of crude oil produced;
6. The rate and manner of water encroachment within the productive formation;
7. The ratio of production of crude oil to estimated reserves;
8. The methods of well completion, presence of gas caps, and presence of gas bearing zones open to any well;
9. Conditions of storage of crude oil recovered;
10. Other characteristics and conditions of the source of supply and production therefrom.

In the promulgation of these regulations the commission will be required to consider and make proper provision concerning, among others, the following factors of waste:

1. The spacing, location, drilling, completion, or production of any well or wells so as to cause waste of reservoir energy;
2. The loss by escape into the air or by wasteful burning of natural gas;
3. The loss by evaporation, exposure or wasteful burning of crude oil;
4. The existence or creation of fire hazards;
5. The drowning with water of any stratum capable of producing crude oil or natural gas, or both;
6. The escape of crude oil from a productive formation through drainage, seepage, or uncontrolled migration;
7. The premature release of natural gas from solution in crude oil;
8. The operation of any well producing crude oil with an inefficient gas/oil ratio;
9. The inefficient, excessive, or improper use of reservoir energy;
10. The excessive production of natural gas alone or in conjunction with crude oil from a source of supply containing both, even though such natural gas is used or transported for use in the generation of light, heat or power, or for other purposes;
11. The abandonment of any well in such manner as to render any crude oil unrecoverable or reservoir energy unavailable for the recovery of crude oil.

Evidences of Waste

In making these investigations, the commissioners must consider the following, or any one of them, to be prima facie evidence of avoidable waste:

1. The operation of any flowing well producing either crude oil or natural gas, or both, substantially at its open-flow capacity;
2. The production of crude oil from any flowing well in any field at a rate which, in its relationship to the known crude oil reserves of said well or field, is substantially in excess of the rate of production in relationship to reserves in other fields in which the commissioner has found that the methods and practices therein employed are effective in preventing avoidable waste;
3. Subsequent to one year after the effective date of this act, the production of crude oil or natural gas, or both, from any field subject to investigation under this act, without the concurrent and reasonably accurate determination, by the producers in said field, of the factors listed in section 5 of this act as applied to said field.

Section 5 is that which lists what is to be considered as avoidable waste within the meaning of the proposed law.

The commissioner would be given authority to approve voluntary agreements to eliminate avoidable waste among the operators in any single oil field. If one or more of the operators, however, fail or refuse to join in the agreement, the commissioner would have the power to issue regulations covering the entire field.

Under the bill, research and experimentation in all phases of the oil industry would be assigned to the new agency and the commissioner would be given power to proceed with such work along these lines as he deemed necessary or advisable.

Section 11, which authorizes cooperation with the states, follows:

"(a) The Commissioner is authorized and empowered, in carrying out the functions vested in him by this act, to to cooperate with the executives, officials, and agencies of the several states, and with any agency or agencies acting pursuant to joint agreement between two or more states and with educational and research institutions and organizations, public and private.

"(b) The Commissioner is authorized in conducting investigations and hearings therewith, to conduct such investigations and hearings in whole or in part jointly with any duly authorized executive, official, or agency of any state and with any agency or agencies acting pursuant to joint agreement between two or more states."

Penalties Provided

The bill provides a penalty of two years imprisonment, a fine of $1,000 a day, or both, for the violation of any regulation promulgated under the authority of the act by the commissioner. Any person who wilfully resists, impedes, prevents or interferes with the performance of the duties under the act, or who wilfully or knowingly provides false or misleading facts would be subject to a fine of not more than $5,000, imprisonment for one year, or both.

The bill would give the commissioner full authority to conduct such investigations as are necessary to determine violations of the act, and when it shall appear to him that any person is engaged or about to engage in any acts or practices which constitute a violation of the act, he may, in his discretion, bring an action in the proper United States district court to enjoin such acts or practices, and upon a proper showing, a permanent or temporary injunction or restraining order would be granted without bond. The appropriate court procedure is outlined in the measure.

There also would be established a Counsel on Petroleum Conservation consisting of 18 members, to be appointed by the secretary of the interior. Nine of the members would be state officials engaged in the administration of petroleum conservation laws, six would be persons engaged in the production of petroleum and three of the members would be engaged in the teaching of subjects related to petroleum at educational institutions. The counsel would meet annually and at such meetings would confer with representatives of the federal government on matters that would be laid before the meeting by members of the counsel and such representatives, concerning

Sadler says Texas reserved her oil

Railroad Commissioner Jerry Sadler of Texas issued a statement Friday deploring the proposed bill for federal oil control, and pointed out that there may be constitutional inhibitions against such control.

Sadler said that when Texas entered the union she preserved all of her lands to the state: and oil is a part of the land.

He urged intensive study of the proposal before the measure reaches a vote, which likely will not be at this session of Congress.

the prevention of waste in petroleum production and the civilian and military needs of the nation.

The bill also incorporates the present Connally "Hot Oil" Act, making it permanent, and placing its administration and enforcement in the office of the new commissioner.

Illinois governor vetoes stripper aid bill

Governor Henry Horner last week criticized the Illinois legislature for failure to enact suitable control legislation when he filed his veto message on a bill designed to aid stripper well operators in the old fields of the state. One other measure pertaining to oil well drilling was disapproved, and three others were permitted to become law without the governor's signature.

After first calling attention to an opinion of the attorney general holding that the bill declaring that no purchaser in any field shall buy crude oil until the productionu of owners of wells producing 5 barrels and less of oil per day had all been taken was unconstitutional in that it sought to provide a "special privilege" to owners of stripper wells, the governor said:

"Bills were offered at the first special session of the 61st General Assembly, which, in my opinion, would have aided owners of wells producing comparatively small quantities of oil. It is common knowledge that in many cases such owners are at a great disadvantage in marketing their product. These bills were patterned after laws of other oil producing states embodying fair and equitable principles sustained by the Supreme Court of the United States. Had these bills been enacted into law, there would have been no occasion for passing a bill such as Senate Bill No. 546."

The governor's reference was to a program of conservation patterned after those of southwestern states which the administration presented to a special session of the legislature last year. The program failed of passage.

Also vetoed was Senate Bill 83, which sought to require drilling of offset wells on threat of lease forfeiture when commercial production was obtained on adjoining land. The governor said this measure violated a portion of the state constitution pertaining to contracts. Passed in the closing days of the session, the subject matter of neither disapproved bill can come before the legislature before another session.

Signs Three Measures

Bills that became law without the governor's signature are:

House Bill No. 1079. It requires every person, firm or corporation drilling for gas, oil, water or any other purpose to file a log of said well in the office of the State Geological Survey Division of the Department of Registration and Education within 30 days after completion of the well, or at time notice is filed of intention to abandon such well if the well is to be abandoned within less than 30 days from the time of completion. It prescribes information to be contained in the log. The Department of Mines and Minerals shall supply the Geological Survey with a duplicate copy of each permit to drill, and notify parties at the time of issuance of permit either to collect or not to collect drill cuttings for the Survey. Cores obtained by core drilling are to be available to authorized representatives of the Survey for inspection and sampling. All logs are to be available for public inspection except as to such information which the owner or operator of the well requests to be kept confidential, but no such information shall be kept confidential for more than one year.

Senate Bill 195. It provides liens for contractors, sub-contractors, material men and laborers for work performed and materials furnished in digging, drilling, building, erecting, completing, operating or maintaining oil wells and pipe lines.

Senate Bill 472. It authorizes the State Department of Public Works and Buildings to enter into an agreement with any person, firm or corporation to take gas or oil from below the beds of any public waters in the state. No agreement would be binding for a period of more than five years, and a surety bond would have to be furnished to secure payment of amounts due the state under such agreement.

Allowable Picture

Humble sues for larger share East Texas output; commission suggests more wells be drilled . . . Cut Louisiana output . . . Michigan law is attacked

Oil men wonder what will happen in East Texas

As a result of a muddled spacing and allowable situation growing out of a lawsuit filed by a comparatively small East Texas operator some months ago, the Texas oil industry was nearer a bad case of the heebie-jeebies at the week's end than it had been in several months as oil men wondered what was going to happen to East Texas proration.

The lawsuit is now familiar to every oil operator in Texas as the Rowan & Nichols case. In it, Judge Robert McMillan held that when a disparity of acreage exists that leads to a disparity of allowables, it was the duty of the railroad commission to adjust those allowables.

The ruling was followed by several petitions from larger companies requesting the commission to comply with Judge McMillan's construction of the law. Until this week, the petitions were ignored. Then came developments thick and fast:

1. The commission, in an order obviously written by Commissioner Jerry Sadler and signed by Chairman Lon A. Smith, countered with the proposal that allowables be "adjusted" by allowing the petitioners to drill more wells.

2. In the face of this order, Humble Oil & Refining Company filed suit to force the commission to adjust its allowable. The suit was set down for hearing before a three-judge federal court in San Antonio August 10.

3. Commissioner Jerry Sadler suggested that there be set down for hearing August 15 the matter of "adjusting" Humble's allowables by giving them more wells.

Suit Important

The implications of the exchange are fairly obvious. To adjust the allowable of the Rowan & Nichols lease made little difference to the aggregate production of East Texas; but to adjust Humble's big share of the field would force every other major producer to come in with a similar suit and the entire East Texas proration plan would be wiped out to all intents and purposes. This is entirely aside from the equities involved in the quarrel between the commission and those who sincerely believe in acreage proration—or something approaching acreage proration.

The railroad commission proposed to accomplish its allowable adjustment method by an amendment to the East Texas spacing rule so as to enable the commission to "upon its own motion or order, issue or grant a permit" as an exception to the regular spacing rules "whenever the commission shall determine that the drilling of any such well or wells is necessary to prevent waste or prevent the confiscation of property."

To reinforce its proposed extension of authority, the new rule alludes to the several times upon which the commission, in official orders or findings of fact, has said that "the more wells that are drilled, the greater will be ultimate recovery," i.e., closer spacing will prevent waste.

Nor, it developed, was the order lightly made. Sadler exhibited a many-paged brief he said he had prepared to bolster the commission's authority to issue well permits without consulting with the fellow who would have to pay for the wells.

In this brief, precedents are cited by which the commission is authorized to enter any order to prevent waste. The brief finds that an appeal could be taken attacking the validity of the order, but "it is difficult to see what complaint a party could make as the commission merely asserts that it has the right to do what the statute makes it mandatory to do." (i.e., prevent waste).

Then the brief says:

"The companies who have filed motions to increase allowables have done so upon the theory that their tracts are drilled to a lesser density than the average of the field, and therefore they should be permitted an increase so as to recover that proportion of the allowable which their acreage or reserves bears to the total acreage or reserves. By granting the permits to drill additional wells they have the ability to

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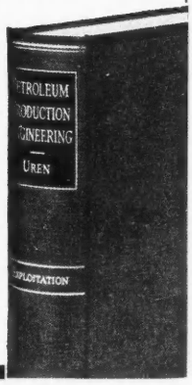

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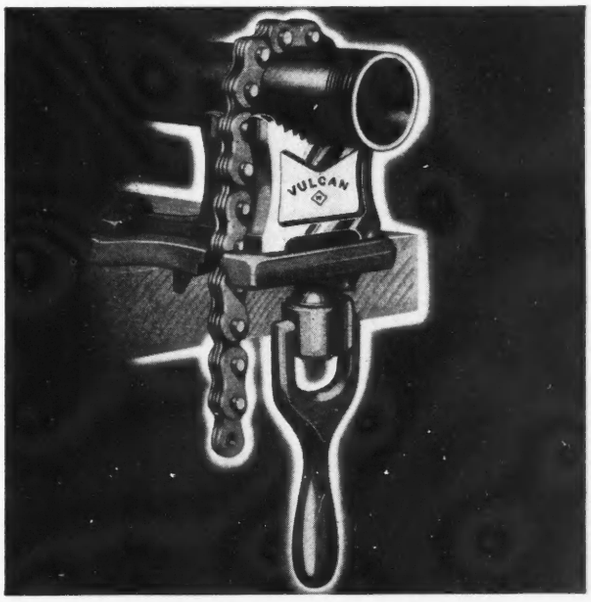

VISES

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drill offset wells which will counteract and equalize drainage.

"Clearly, before a company could file a suit to force an increase in allowables it would be required to apply to the commission for relief. The commission would be authorized to set down for hearing the matter of whether the company's oil was being confiscated or whether waste was occurring, and after such hearing, after it was found that confiscation or waste, or both, were resulting, the commission could grant permits to drill additional wells instead of increasing the allowables."

What other commissioners than Sadler thought about the lawsuit was not immediately ascertained. Commissioner Ernest O. Thompson and Chairman Lon A. Smith were absent from their offices most of the week.

Humble's suit asked that its allowable be increased by an amount equal to 4.4 percent of the total field outlet. In announcing that the suit had been filed, Humble's Rex Baker issued a statement saying in part:

"Humble Oil & Refining Company announces that it is filing suit today in the United States District Court at Austin asking that its total allowable production of oil from the East Texas field be increased by approximately 4.4% of the total allowable for the field. The relief asked for by Humble in its petition is in conformity with the principle established in the decision of Judge McMillan of the United States District Court for the Western District of Texas in a decision recently issued in the case of Rowan & Nichols Oil Company v. Railroad Commission of Texas. Following the decision in the Rowan & Nichols case the Humble Company, on June 16, filed a petition with the railroad commission asking it to modify its order for the East Texas field so that same would allow Humble to produce its fair share of the recoverable oil from the field.

"In the suit Humble is not attacking the conservation laws of the state, nor is it asking that the total daily allowable from the field be increased, but it is merely asking that the proration order of the railroad commission for the East Texas field be written in such a way as to give to it an opportunity to produce its fair share of the recoverable oil from the field. Humble has under its leases in the East Texas field approximately 14.4% of the recoverable oil. Under the present order it is allowed to produce only 9.932% of the field allowable and is, therefore, deprived of an opportunity to produce approximately 4.4% of such allowable to which under the law, it is justly entitled.

"The principles upon which the present suit is based have been established in a decision by the Texas Supreme Court in the Brown v. Humble case, and in United States Court by Judge McMillan in the Rowan & Nichols case, above mentioned, and in other similar cases both in state and federal courts. In those cases it was held substantially that an owner of a tract of land should be given the opportunity to produce that share of the total allowable production from the field as the oil in place under his land bears to the total oil in the field. Humble, in the present suit, is simply asking that the railroad commission order be written so as to give effect to these principles."

Louisiana cuts August allowable 22,500 barrels

Louisiana's oil production, under scrutiny of a federal investigation, will be cut 10 percent in August. The Department of Conservation's August order gave a quota of 241,602 barrels daily, or 22,563 barrels under the July allowable.

Practically the entire reduction was placed upon South Louisiana fields, which will be permitted to produce 179,165 barrels daily in August in contrast with 201,610 barrels in July. North Louisiana fields were practically unchanged at 62,437 barrels.

The daily proration order was the first signed by Ernest S. Clements, new commissioner of conservation, who succeeded William G. Rankin, who resigned earlier in the week at the request of Governor Earl K. Long.

Atkinson oil control bill becomes California law

July 23 Governor Olson's signature made the Atkinson oil control bill a law, despite the objections of some California operators who fought it while in committee. Unless a referendum is obtained, the bill goes into effect within 90 days.

Meanwhile, two referendum petitions designed to repeal the oil proration bill have been filed with the attorney general's office, one being submitted by W. B. Bobbitt of West Los Angeles, and the other by the Oil Conservation League, headed by Delbert J. Arthur, president and Dan R. Mears, secretary. Similar action was expected to be started by J. M. Inman, Sacramento lawyer. If the referendum petitions are signed by 5 percent of voters who cast votes for gubernatorial candidates at the last general election, they will go on the general election ballot in 1940.

The law, written by Assemblyman Maurice Atkinson of Long Beach, Democrat, creates a new Oil Conservation Commission, provides for the allocation of production among fields of the state and for control of new well drillings and permits California to join other oil producing states in the regulation and control of crude oil. Opposition to it is being led by John A. Smith, president of the Independent Petroleum and Consumers' Association.

New Louisiana Official

State Senator Ernest Clements, 41, of Oberlin, Allen Parish (where there is no oil inside the county lines) took up his duties in New Orleans as Conservation Commissioner and will have charge of the state's oil business regulations. Clements was appointed Monday following the requested resignation of William G. Rankin. The conservation commission in Louisiana also has charge of fishing, etc., in fact, all natural resources.

Kent County men attack Michigan conservation law

The first legal test of Michigan's 1939 Oil Conservation Act was in the courts this week when a group of Kent County land-royalty owners and a development company filed suit to enjoin J. P. Hoffmaster, supervisor of wells, against enforcing proration based on the acreage factor on certain wells in the Walker oil field.

Suit was brought by John G. Fletcher, land-royalty owner, Swanson Consolidated Oil Company et al. The bill of complaint attacks the constitutionality of the oil act on 14 counts, including alleged placing of legislative authority in a purely administrative body. The bill complains that wells drilled by Swanson Oil Company prior to the effective date of the act, with locations approved by the Conservation Department, since have been prorated on an acreage factor to constitute an expo facto interpretation.

In the suit Hoffmaster, the supervisor, and the six members of the advisory board, created by the law, are made defendants. Circuit Judge William B. Brown, Kent County, signed an order directing the defendants to appear in court July 27 to show cause why an injunction should not be issued to prevent enforcement of the act.

Proration for the Walker field is 200 barrels flat allowable for a well on 10 acres. Swanson's 3 wells are prorated to a combined output of 190 barrels per day, due to less than 10-acre locations.

Arkansas hikes allowables for August and September

The Arkansas Oil & Gas Commission, following a hearing, boosted the state's August and September daily oil allowable by 10,000 barrels to 64,991 barrels daily. The allowable includes 34,791 barrels for flush and controlled fields and 30,200 barrels daily for settled pools, which now includes the Miller County part of Rodessa.

Oklahoma allowable left at 428,000 barrels in August

Oklahoma allowable output for August was set at 428,000 barrels daily, identical with July, when the order was issued July 28. The Oklahoma Corporation Commission went on record as favoring reductions in percentages to bring output down to the allowable figure.

Oil in the Courts

Convicted concerns in first Madison trust suit granted new trial by appeals court . . . Texas commission's spacing power enlarged by ruling

Oil wins major victory in Madison trust suit

The oil industry, first of business groups to be subjected to federal investigation for alleged monopolistic activity sustained a major victory in its fight to defend its business practices last week when the United States District Court of Appeals at Chicago reversed a conviction of 12 major companies and 5 company officials which the government obtained more than a year ago. The appeals court gave 4 reasons for its decision, and remanded the case back to the district court for retrial.

The decision affected one of three groups of defendants involved in the "first" Madison anti-trust trial. The trial ran for 111 days before District Judge Patrick T. Stone between October 4, 1937, and January 22, 1938; and resulted in a jury verdict of guilty against 16 companies and 30 individuals. During that trial, indictments against 7 corporations, 16 individuals and 3 trade journals were dismissed.

Five months later, Judge Stone ruled on defense motions and divided the defendants into three groups. He set aside the verdict and dismissed the indictments as against 1 company and 10 individuals; granted new trials to 3 companies and 15 individuals; and upheld the verdict as to 12 companies and 5 individuals. It was to this latter group, of which companies were fined $5000 each and individuals $1000 each, that last week's circuit court ruling pertained.

The appellate court five months ago upheld that part of Judge Stone's ruling by which 1 company and 10 individuals were released. The government had sought to have the ruling set aside on the contention that the court was without power to rule on the motions after jury verdict.

In Washington, Thurman Arnold, assistant attorney general in charge of the anti-trust division of the Department of Justice, announced the appellates courts ruling would be appealed to the United States Supreme Court.

Findings of the Chicago court are of

Louisiana Probe

Additional federal investigators are sent into state to follow many leads . . . Grand jury has commenced study of alleged corruption in oil

Federal probe in Louisiana intensified

Louisiana's oil industry apparently is due for a thorough investigation during the coming months, if developments of the past week are good indicators. Additional federal investigators arrived on the scene to probe alleged new leads, and a federal grand jury commenced quizzing of various state officials and issued summons for several oil company employees.

George Holland, head of the petroleum conservation division, is in New Orleans directing the work of eight men who are auditing books, checking wells and issuing subpoenas. Last week also saw the return of John Rogge, an assistant attorney general, after he had reported to Attorney General Murphy in Washington.

Meanwhile a federal grand jury at New Orleans heard William G. Rankin, former head of the state's conservation department; Dr. J. A. Shaw, reinstated head of the conservation department of minerals; and former governor Richard W. Leche.

United States District Attorney Rene Viosca and George Holland were frank to admit that the grand jury inquiry was being directed toward hot oil runs in the state that violated the Connally act. Although the daily allowable for the state was set at 264,163 barrels for July, estimates of production in the state for the past three weeks have been 275,000 barrels.

Although Friday is the day set aside for the returning of indictments by the grand jury, none were brought in last week, as plans were made to further question Leche, Shaw and others.

The past week also saw another shift in Louisiana Conservation Department, as William G. Rankin resigned as its head at the request of Governor Earl K. Long, after Rankin had refused to permit his books to be inspected by a group of business men. State Senator E. S. Clement of Oberlin was appointed his successor. Still another change was the surprising reinstatement of Dr. J. A. Shaw as director of the minerals division in the Conservation Department. Shaw had been removed three weeks ago by Governor Long. The dentist has been director of the division since 1929. David B. McConnell, brother-in-law of the late Senator Huey P. Long, who had succeeded Dr. Shaw, reverted back to his former post of manager of the Shreveport division.

It was announced the state would cut production 10 percent during August, about 22,500 barrels under July.

Direct Federal Investigation in Louisiana

Louisiana's hot oil industry looks now as if it is really due for a going over. George W. Holland, head investigator for the Interior department's conservation enforcement department, seated at extreme left, arrived in New Orleans Monday to take charge of the work of the state. Extreme right, standing, is Jack Steele, head of the Federal Tender Board No. 1, of Kilgore, Texas, also in New Orleans for the grand jury meeting. Standing, left, is Rene Viosca, U. S. District Attorney, in whose care the indictments will be handled, and seated is Assistant District Attorney Arnold Raum.

inestimable value to defense counsel, as they upheld contentions of oil companies counsel that had been vigorously but unsuccessfully championed during the lower court trial. The higher court held that the question that should have been submitted to the jury was whether actions of defendant companies in purchasing distress gasoline on the tank car market in the East Texas and Mid-Continent fields resulted in an unreasonable restraint of trade.

The question put to the jury in line with the prosecution's charges was whether the defendants were in a conspiracy which was a violation of the Sherman Anti-Trust Act.

Defense counsel, on numerous occasions during the trial, attempted to supply the jury with a "background" of conditions prevailing in the oil industry just prior to and at the time of the actions complained of in the indictment. Each time, however, testimony on this point and on similar but unsuccessful stabilization efforts of the government under the National Recovery Act just prior to the period covered by the indictment were ruled inadmissible by the court when objection was raised by government attorneys.

On this question, the Chicago court ruled:

"Efforts by the government during NRA to stabilize the prices of crude oil and gasoline should have been considered by the jury in determining the character of the restraint and the good faith of the defendants in undertaking to remove the surplus gasoline from the spot market."

Another reason for the reversal was that some arguments of government attorneys before the jury were improper, Judge J. Earl Major who wrote the opinion, declaring: "Some of the arguments complained of were highly improper and taken in connection with misuse of grand jury testimony would present a very serious obstacle to the affirmance of judgment."

Suit Based Wrongly

Government use of grand jury testimony before the jury was also hit by Judge Major.

"The case was submitted to the jury on the theory that it was **per se** violation of the Sherman Anti-Trust Law," the court said in a 25,000 word opinion. "We hold it should have been submitted on the question of the reasonableness of restrictions on interstate commerce.

"It was the governments position that the combinations together with the manner in which it was carried into effect, constituted a violation of the anti-trust act. Under this theory the character of the restraint was not a jury issue.

"On the other hand it was the contention of the appellants that the purpose of the combination was to remove surplus gasoline which it claimed was a competitive abuse and that in so doing the statute was not violated. The district court charged the jury on the government's theory that is, that the combination was illegal as a matter of law and the jury was not permitted to inquire into the character of the restraint imposed on Interstate Commerce."

In view of a question raised at the time the indictments were issued three years ago—why a district court in a state without any oil production whatsoever should have been chosen for trial of the industry—a statement of Judge William M. Sparks, in a concurring opinion, is interesting. Judge Sparks said he believed that venue "of this prosecution was improperly laid in the Western District of Wisconsin."

Companies and individuals affected by last week's ruling are:

Socony-Vacuum Oil Company, Inc., Wadhams Oil Company, Empire Oil Refining Company, Continental Oil Company, The Pure Oil Company, Shell Petroleum Corporation, Sinclair Refining Company, Mid-Western Petroleum Corporation, Phillips Petroleum Company, Skelly Oil Company, The Globe Oil and Refining Company (Oklahoma), The Globe Oil and Refining Company (Illinois), Charles E. Arnott and H. T. Ashton of Socony-Vacuum, R. H. McElroy, Jr., of Pure Oil, P. E. Lakin of Shell and Robert W. McDowell of Mid-Continent.

Stiffer civil penalties urged in trust suits

Desirability of stiffening the civil penalties of the anti-trust acts as a deterrent to monopoly in the oil and other industries was urged upon a Senate Judiciary Subcommittee considering his measure July 28 by Senator Joseph C. O'Mahoney (Dem., Wyo.).

Explaining that his bill has been introduced as a result of disclosures during the monopoly investigations of the Temporary National Economic Committee, of which he is chairman, Senator O'Mahoney asserted that increased use of civil proceedings instead of criminal cases would speed up compliance with the anti-trust laws by the major industries.

Under the O'Mahoney bill officers and directors concerned with anti-trust law violations by their corporations could be required to forfeit double the amount of remuneration received from the corporations for every month in which a violation occurred and could be barred from further service to or receipt of compensation from their companies for such period as the courts might decree. The corporations themselves could be fined double their net income for every month in which a violation occurred.

The senator explained that the imprisonment penalties of the anti-trust statutes are seldom imposed because it is not generally considered that a monopoly violation is in the same category as a crime involving moral turpitude, while the fines imposed are rarely so heavy as to cause any concern to large corporations.

Court lays down new Texas spacing rules

Far reaching significance was seen by oil attorneys in an opinion last Wednesday by the Texas Supreme Court re-defining the Texas Railroad Commission's powers over the spacing of oil wells.

Judge Richard Critz, speaking for the court, specifically overruled all prior appeals court opinions conflicting with the court's latest pronouncement, thus in effect laying down a complete new set of rules to guide the drilling of special exceptions to the established spacing rule, known as Rule 37.

Rule 37 law already constitutes one of the bulkiest "volumes" in legal lore; and the new opinion was a significant additional chapter.

Powers Widened

From the non-legal standpoint, it had one standout feature: The Texas Railroad Commission is the sole judge of facts at a hearing on an application for a Rule 37 exception; and the courts cannot substitute their judgment for that of the commission unless the evidence preponderantly shows that the order was arbitrary, capricious and discriminatory.

In other words, if the commission in granting a well says that it was granted to prevent waste, the evidence must overwhelmingly show that such was not the case before the courts can set aside a permit.

The case will be known as the Gulf Land case: Gulf Land Company v. Atlantic. Gulf Land got a permit to drill a second well on a 2.38-acre tract in East Texas. Atlantic contested it, got it set side in the lower courts, and this judgment was affirmed by the Supreme Court.

Because the Supreme Court held the particular permit invalid, first blush constructions of the opinion were that the commission's powers had been limited.

These constructions quickly were dispelled by a reading of the opinion. The particular permit had been granted as an exception on the grounds of confiscation; the evidence did not support confiscation. The commission made no finding on the issue of waste. The inference clearly left was that had the permit been issued "to prevent waste" the courts would have sustained the permit.

And in addition to this general finding, the court laid down numerous other minor rules in Rule 37 cases. Starting in the early part of the opinion and following it through in chronological order:

"Counsel contend the permit was void because it was granted after the commission had granted a motion for rehearing filed more than 20 days after the commission had entered an order denying it. It is true that the commission has a rule that such motions shall be filed within 20 days . . . (but) . . . the order was entered on a new application. The mere fact that the commission had twice before refused this well did not deprive it of jurisdiction to grant it in response to a new application."

". . . We do not understand that the commission by the promulgation of Rule 37 has said that it will be presumed that any well drilled at lesser distances than the minimum spacing distances named in the rule will cause waste . . . The commission has simply promulgated a rule fixing minimum spacing distances at which wells may be drilled without application. Anyone desiring to drill at lesser distances must secure a special permit. . ."

Exceptions, the court continued, may be granted to prevent waste or confiscation, requiring definition of those terms:

"Waste means the ultimate loss of oil. If a substantial amount of oil will be saved by the drilling of a well that

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otherwise would be lost, the permit may be justified to prevent waste . . .

"The term confiscation as used evidently has no reference to waste. It evidently has reference to depriving the owner of a fair chance to recover the oil under his land. It refers principally to drainage. The right to protect lands against confiscation is not absolutely unconditional. An examination of the (East Texas) rule of May 29, 1934, will show that subdivisions of land which come into existence after Rule 37 was promulgated are not protected at all against confiscation. Permits may be issued to protect such tracts from waste, but not from confiscation . . . The May 29 rule means that where a tract is of such size and shape that it is necessary to obtain a special permit before a well can be drilled thereon, such a tract will be regarded as a subdivision, if it had been divided out of a larger tract."

After laying this groundwork for the ultimate invalidation of the permit in question, the court then proceeded to the larger issue of the commission's powers:

"The commission is the primary fact-finding agency . . . It is the undoubted intention of the statutes to clothe the district court with all the statutory jurisdiction in passing on all questions of law which arise in the appeal from the commission to the court. (But) the duty of defining the jurisdiction of the court to hear and determine fact questions has given us very grave concern.

"We hold that the appeal provided by law contemplates that the district court shall exercise its general jurisdiction in determining all questions of law. We think, however, that generally speaking the law contemplates that the commission shall be left free to finally determine controverted issues of fact . . . necessary or proper to be determined in passing upon applications for such exceptions. Fact findings are subject to review and correction by the courts only to a limited extent. The court should not set aside an order unless such order is illegal, unreasonable, or arbitrary. The order is not illegal if it is reasonably supported by substantial evidence. To permit the court to substitute its fact findings on controverted issues of fact would add nothing of value to the administration of the law or the rule, and would destroy all uniformity of commission administration."

The court then discusses the particular permit, finds it was granted to prevent confiscation in the face of the May 29 rule which says no well may be granted to prevent confiscation on a subdivided tract.

But Gulf Land's counsel also contended there was sufficient evidence to sustain the well on the issue of waste. The fact that the tract had been subdivided would be "no impediment" to drilling it to prevent waste; but "the commission made no finding on that question, and we are unable to say, as a matter of law, that this record shows a necessity for this well for such purpose." By so holding, the court followed its own rule that the court's judgment on fact issues would not be substituted for the judgment of the commission.

"If the commission had merely made a general finding of fact, or if it had made no express finding of fact at all, we could and would presume all controverted fact issues as found in favor of the order entered."

There is the most significant paragraph in the entire opinion. What it says is: If the commission issues a special permit to drill an exception with the mere general statement that the well is necessary to prevent waste, the courts will presume that the commission considered all the fact issues and resolved all controverted facts in favor of the permit.

But, the court goes on, the commission's several findings to the effect that "the more wells are drilled, the greater will be the ultimate recovery" does not necessarily mean that every application for a well must be granted in order to increase ultimate recovery. "It is just as important to conserve oil and gas after they have been produced as it is to conserve such products in the production." Above ground waste also must be considered by the commission; the commission must consider the orderly and scientific development of the field; there must be a specific finding of waste to uphold a permit.

The commission must always be fair in determining the issue of waste, Judge Critz continued, but latitude must be allowed the commission "because the subject of administration is so vast, complex and complicated that its administrative agency cannot be placed in an absolute strait-jacket. Judge Holmes said the machinery of government would not work if it were not allowed a little play in its joints."

On that note the opinion closes, after specifically overruling all opinions in conflict with it.

Whether it adds light is a question for lawyers to determine. Certainly it offers no comfort to those who differ with present administrative policies of the commission.

Court limits tender board jurisdiction

Federal Judge Randolph Bryant denied the government's plea for mandatory injunction against a group of East Texas oil operators who had refused to file monthly reports to the Federal Tender Board on the grounds they were doing only an intrastate business and therefore did not come under the board's jurisdiction. Judgments were filed at Tyler July 25 after both sides had submitted briefs.

He accordingly dismissed the cases, brought in the name of the President of the United States against W. R. Skeen and Dick Duncan of Tyler, Octo Oil Corporation, Theron Oil Company and Beacon Oil & Refining Company and T. P. Cannon of Henderson.

In the suit against Skeen and Duncan, the court ruled there was no equity in such a suit and ordered complainants to pay costs. Jim Saye, Longview, and Dan Boone, Wichita Falls, who appeared for defendants, cited the Panama case on which Judge Bryant himself ruled which in time was upheld by the United States Supreme Court and threw out Section 9c, the Petroleum Code of the NRA.

Pipe Line News

Important new projects are announced . . . Rocky Mountain area to get new 438-mile outlet . . . Will build East Texas to Gulf 192-mile gasoline line

Plan Wyoming to Salt Lake City oil carrier

T. A. Dines, president of Utah Oil Refining Company, July 25 announced plans for construction of a crude-oil pipe line connecting its Salt Lake City refinery with various oil fields in Wyoming from which the company is obtaining most of its crude supply by tank car shipment.

First announcement of the line appeared in THE OIL WEEKLY of July 10, 1939.

The line will be approximately 438 miles long, of which 414 miles will be 8-inch and 24 miles 6-inch pipe. Its easternmost point will be at Fort Laramie, Goshen County, Wyoming, where it will connect with the lines of Illinois Pipe Line Company and of Rocky Mountain Pipe Line Company from Lance Creek field. From Fort Laramie the new line will cross the Laramie mountains and follow a general westerly course across the southern part of Wyoming and down into Salt Lake City.

Pipe will be seamless, welded at joints, and wrapped and coated.

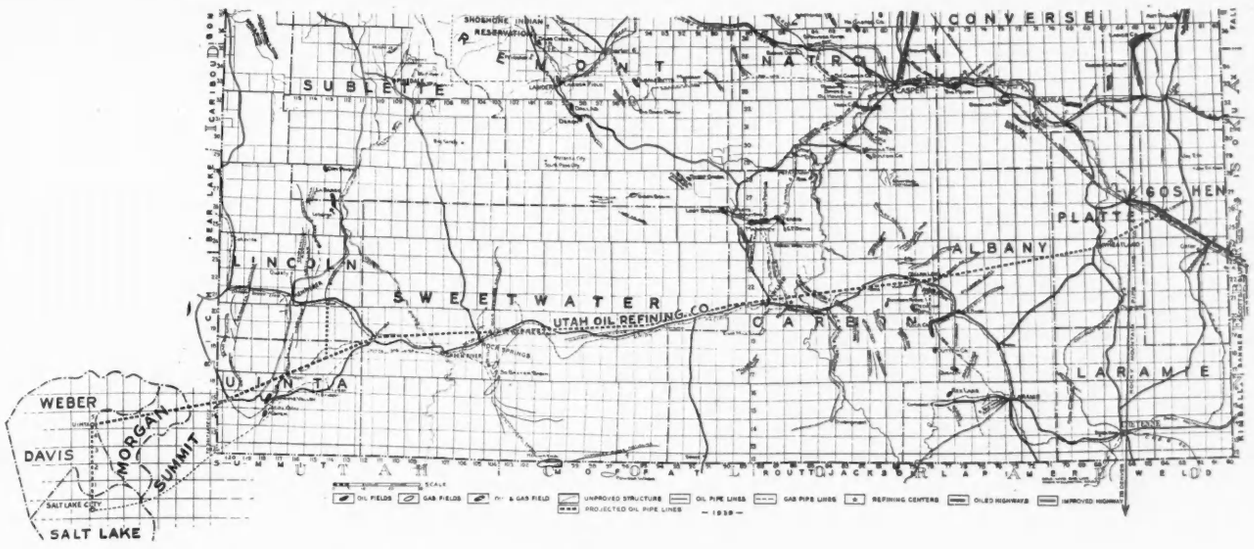
A 6-inch branch line is projected from Craig, Colorado, connecting with the main line near Wamsutter, Wyoming. The line will be constructed to operate throughout the year, and the necessary pressure will be provided by five pump stations.

Utah Oil Refining Company has operated its Salt Lake City refinery, 8500 barrels daily throughput, on Wyoming crude for the most part during the past 25 years, and construction of this pipe line will not disturb its present sources of crude supply in Wyoming.

However, the pipe line will provide an outlet for new fields, which may be developed along its route, as production from existing fields declines. Its construction will also stimulate employment this year in a rather sparsely settled district where new projects are much needed, and in addition will give permanent employment to a substantial number of men engaged in operating the line.

Utah Oil Refining Company is a subsidiary of Standard Oil Company (Indiana). However construction of this proposed line will not affect the operations of Indiana's Casper and Greybull refineries located in Wyoming.

Crude transported through this new line will be used for the manufacture of products which will be sold by Utah



Route of Utah Refining Company's 438-mile oil line from Laramie, Wyoming, to Salt Lake City.

Oil Refining Company in the Utah and Idaho markets, which form an entirely separate marketing territory from that in which Indiana's products from the Casper and Greybull refineries are distributed.

Complete plans for the project have been worked out and construction will be started immediately. This line is unique in that it will be the first major pipe line to be constructed in the Rocky Mountains across the Continental Divide. The line is expected to be completed and in operation by the end of this year.

Two other lateral lines are projected to be laid with 4-inch pipe. One is from Rock River field, Carbon County, north to the main line, a distance of 11 miles to the main line, and the other 31 miles south from Opal, Sublette County, to the main line. The lateral from Opal ties into Stanolind Pipe Line Company's 4-inch line 34 miles north to the LaBarge field.

The main line will deliver crude from the active Lance Creek field in eastern Wyoming; the Rock River field and Big Medicine Bow fields, south-central Wyoming; the LaBarge field, southwestern Wyoming; and the Iles Dome field, Moffat County, northwestern Colorado. Other fields within short distances of the line include: Quealy, Albany, County, Wyoming; Wertz, Mahoney, and Lost Soldier, Carbon County, as well as several other smaller fields in Wyoming and in northwestern Colorado.

Elevation at eastern terminus, Fort Laramie, Wyoming, is 4230 feet. High point on the line is a point just east of Wamsutter where it will cross the Continental Divide at 7178 feet. Cost of the line will approximate $7,000,000.

At Fort Laramie, the line forms a juncture with Stanolind Pipe Line Company's 700-mile gravity flow line from Teapot, Wyoming, to Freman, Missouri. This means that should flow in the Salt Lake line be reversed, crude oil from fields across the southern sector of Wyoming could reach nearly every important refining center in Middle West and every important port in Gulf Coast and Atlantic seaboard through connections of Stanolind Teapot-Freman line to major pipe line systems of eastern half of United States. This points definitely to a probable call on Rocky Mountain reserves for future economic or possibly military needs.

Magnolia building gasoline line, East Texas to Beaumont

Magnolia Pipe Line Company has authorized immediate construction of a 192-mile gasoline line to extend from the East Texas field to Magnolia Petroleum Company's principal refinery at Beaumont. The latter has negotiated contracts to purchase a portion of the natural gasoline and butane production of 5 gasoline plants for 3 years, with options to extend the contracts. The line will have a capacity of 4000 barrels daily, and is scheduled to be in operation by October 1.

Contract for the laying of the gasoline carrier will be awarded as soon as contractors' bids are tabulated.

Telescope type of line will be employed, using 125 miles of 4-inch; 59 miles of 5-inch; and 8 miles of 6-inch diameter welded pipe. It will extend southeast from Magnolia Pipe Line Company's Kilgore station and crude tank farm, George W. Groce Survey, Gregg County, immediately east of the East Texas field, and parallel to a 10-inch crude line, via Center to Beaumont. Gathering lines will be built from the Kilgore station to each of the 5 gasoline plants.

Only two booster stations will be utilized on the gasoline line. A booster will be erected at the Kilgore site, and

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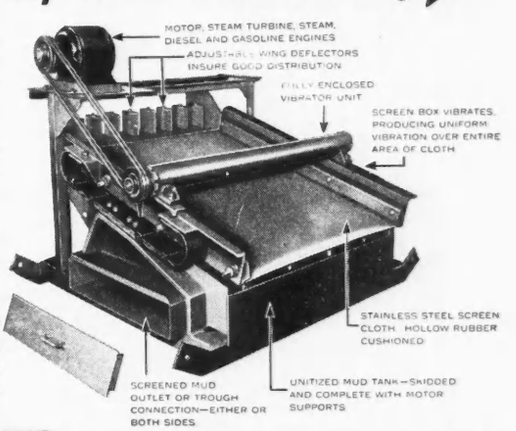
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an intermediate station at Francis, Sabine County.

Magnolia Petroleum Company operates a gasoline line from its Fort Worth refinery to Dallas, and also a carrier from its Luling refinery to San Antonio.

The shipment of natural gasoline and butane from the East Texas field along with crude by pipe line has been practiced by some companies since the field became a major source of the above products. Humble Pipe Line Company's shipments assumed sufficient proportions to warrant the conversion of an 8-inch unit of its multiple system into a gasoline carrier, which has been in continuous service since July, 1936.

Reinstate application on Kentucky-Indiana gas line

General Gas Pipe Line Corporation, Indianapolis, has asked for reinstatement of its application to the federal power commission for permission to construct a natural gas pipe line from Central Kentucky into Central Indiana. The project contemplates a 130-mile 20-inch line, connecting Kentucky fields with utility and industrial markets of Central Indiana.

The company's original petition was dismissed without prejudice when, at a hearing, counsel for the company declined to disclose information regarding the available market, gas reserves and methods of financing, the commission said.

Market Situation

Outlook improves as 1,456,000 barrels of gasoline and 1,149,000 barrels of crude oil are drawn from stocks . . . Minor refined product price changes

Gasoline and crude stocks continue to shrink

The oil industry's outlook continued to improve the past week, as the accelerated rate of reduction in gasoline stocks that was in evidence the preceding week prevailed during the past week. The withdrawal of 1,456,000 barrels of gasoline from storage, coming as it did upon the heels of a 1,407,000 barrels reduction the preceding week, gave hope that the industry might finish the summer in a stronger statistical position than believed likely heretofore. However, these two weeks of substantial reductions, left gasoline stocks of 77,960,000 barrels, or 2 percent larger than a year ago's total of 76,366,000 barrels.

Crude stocks also continued to be reduced rapidly. There was 1,149,000 barrels taken from these stocks, despite enlarged output at wells, as runs to stills climbed 5000 barrels to 3,395,000 barrels daily. This carried crude stocks to 268,199,000 barrels, on July 15, which was 7.3 percent less than a year ago and established a new 17-year low level.

Stocks of gas oil and distillate fuels jumped 693,000 barrels to 34,366,000 barrels, but residual and fuel oil in storage declined 40,000 barrels to 114,035,000 barrels. The former is 6.1 percent greater than a year previous, while the latter class of fuel in storage was 5.8 percent less than held at the corresponding period a year ago.

Gasoline Production Increases

Average daily production of gasoline during the week ended July 22 was 1,619,400 barrels, an increase of 2300 barrels upon the daily rate of the week prior.

Crude prices steady but product prices fluctuate

Crude oil prices went unaltered last week, with several localized variations in finished product prices reported. While gasoline prices were steady, with Mid-Continent suppliers reporting that supply and demand were in fair balance, kerosene was off and fuel and bright stock oils were up.

Demand for kerosene was apparently slightly softer as the tendency toward reduced quotations that originated in the Oklahoma market last week was seen on the Chicago market, where some bids dropped ⅛ cent to 3⅛ cents for the 4-43 water white grade, and 3¼ cents for the 42-44 water white grade.

Fuel oils on the Chicago market brought ¼ cent more, or 3½ cents, in some sales of the No. 2 grade, but fell on the Mid-Continent market. Range oil there in some sales sold for ⅛ cent under the prevailing 3⅝ cents price, while No. 1 p.w. fuel oil was sold ¼ cent under the 3⅝ cent market.

Bright stock oils advanced in price on the Pennsylvania refinery market, the quotation for 25 pour test moving up ½ cent to 16 cents. Other quotations reported for this grade ranged upward from 16 cents, while prices on the 10 and 15 pour bright stocks were also advanced ½ cent

Bloomingdale price hike is met by other buyers

Tri-Lakes Corporation's 5-cent per barrel advance, effective July 16, for Bloomingdale District (Van Buren County) grade crudes this week had been met by other carriers in the Michigan field, but prices in other fields continued unchanged. Tri-Lakes advanced price from 78 to 83 cents. The only other field affected was Bangor, also in Van Buren County, where Vandale Corporation, sole buyer, advanced from 63 to 68 cents. About 450 barrels per day only is being produced in Bangor.

Trends of United States Production and Stocks

Figures are from American Petroleum Institute weekly reports, except those on crude stocks, which are from Bureau of Mines weekly reports

	Crude Oil Production (Barrels Daily)	Crude Runs to Stills (Barrels Daily)	Crude Oil Stocks (Barrels)	Gasoline Stocks (Barrels)	FUEL OIL STOCKS	
					Gas Oil & Dist. Fuels	Residual Fuel Oil
1937						
August 28	**3,731,450	3,425,000	309,506,000	66,997,000	112,111,000	
September 25	3,666,300	°3,455,000	307,974,000	65,620,000	116,472,000	
1938						
March 19	3,433,550	3,080,000	306,380,000	**93,192,000	122,067,000	
June 25	3,083,900	3,025,000	293,463,000	82,412,000	25,343,000	112,458,000
July 30	3,316,400	3,240,000	288,514,000	76,864,000	27,573,000	116,721,000
August 27	3,388,500	3,255,000	285,029,000	71,754,000	29,747,000	117,179,000
September 24	3,251,150	3,220,000	280,278,000	68,605,000	31,183,000	119,285,000
October 29	3,237,500	3,145,000	275,824,000	67,590,000	33,690,000	120,029,000
November 12	3,243,250	3,180,000	273,394,000	¶67,551,000	34,175,000	120,491,000
November 26	3,260,900	3,295,000	270,563,000	68,628,000	33,749,000	119,885,000
December 10	3,245,100	3,150,000	269,509,000	68,587,000	32,068,000	118,711,000
December 31	3,201,450	3,115,000	273,024,000	71,695,000	29,082,000	115,741,000
1939						
January 28	3,248,250	3,235,000	271,763,000	77,279,000	26,583,000	112,766,000
February 25	3,328,850	3,185,000	271,758,000	84,597,000	23,419,000	110,252,000
March 25	3,382,350	3,225,000	273,915,000	87,561,000	21,487,000	107,551,000
April 22	3,526,700	3,280,000	277,156,000	*87,769,000	21,058,000	105,035,000
April 29	3,568,200	3,405,000	278,440,000	86,794,000	†25,844,000	†108,409,000
May 6	3,580,900	3,275,000	*278,607,000	86,216,000	26,167,000	108,597,000
May 20	3,438,400	3,460,000	277,068,000	84,294,000	26,389,000	109,405,000
May 27	*3,585,250	3,405,000	278,289,000	84,152,000	26,992,000	109,386,000
June 3	3,558,800	3,415,000	277,947,000	83,637,000	27,440,000	110,219,000
June 10	3,376,950	**3,510,000	274,692,000	82,716,000	29,357,000	111,239,000
June 24	3,452,800	3,430,000	272,297,000	81,733,000	30,239,000	111,726,000
July 1	3,463,000	3,480,000	271,567,000	81,102,000	31,230,000	113,388,000
July 8	3,529,800	3,420,000	269,348,000	80,823,000	32,435,000	113,494,000
July 15, 1939	3,529,700	3,390,000	§268,199,000	79,416,000	33,673,000	114,075,000
July 22, 1939	3,583,750	3,395,000	.....	77,960,000	34,366,000	114,035,000
July 23, 1938	3,349,050	3,180,000	‡289,312,000	76,366,000	*	††
Change in past year	+7.0%	+6.8%	—7.3%	+2.1%	+6.1%	—5.8%

** All time peak. * Peak for 1939. § Lowest for 17 years. ‡ Stocks July 16, 1938.
° Peak prior to 1939. ¶ Lowest for year.
† Prior to April 29, 1939, data did not include stocks at terminals, in transit, etc., except in California.
* Available data for year ago include only stocks at refineries, and not at terminals, in transit, etc., except in California. Those stocks on July 22, 1938, totaled 26,062,000 barrels, and comparable stocks on July 22, 1939, totaled 27,660,000 barrels, or 6.1% more.
†† Available data for year ago include only stocks at refineries, and not at terminals, in transit, etc., except in California. Those stocks on July 22, 1938, totaled 115,879,000 barrels, and comparable stocks on July 22, 1939, totaled 109,517,000 barrels, or 5.8% less.

ranging upward from 18.5 and 17.5, respectively.

U. S. motor gasoline at Oklahoma refineries ranged last week about as follows: 62 octane and below, 4¼ to 4⅝ cents a gallon; 63 to 66 octane, 4½ to 4⅞ cents; 67 to 69 octane, 4¾ to 5⅛ cents; 70 to 72 octane, 5 to 5⅜ cents.

Corresponding prices in the Chicago market were: 3⅞ to 4½ cents, 4 to 4½ cents, 4¼ to 4⅞ cents, and 4⅜ to 5¼ cents.

In East Texas, 60-62, 400 end point gasoline was priced generally at 4¼ cents a gallon.

Natural Gasoline

Natural gasoline, grade 26-70, was selling in the Mid-Continent markets, f.o.b. refineries at 2¾ to 3 cents a gallon, and sales were reported at the same price f.o.b. Breckenridge, Texas.

Kerosene prices f.o.b. Oklahoma refineries ranged from 3⅝ to 4¼ cents a gallon for the 41-43 water white grade, and from 3¾ to 4⅝ cents for the 42-44 water white grade; and corresponding prices in the Chicago market were 3⅛ to 4 cents and 3¼ to 4¼ cents.

In the Chicago market range oil was priced from 3¼ to 3⅞ cents a gallon. The No. 1 white oil was priced from 3 to 3¾ cents, and No. 1 straw from 3 to 3⅜ cents. No. 2 straw was 2⅞ to 3½ cents. No. 3 oil was 2¾ to 3⅛ cents. No. 5 oils were 57½ to 65 cents a barrel. The No. 6 oil was quoted at 35 to 45 cents.

Crude Production

Decline of 10,125 barrels daily follows drop in Oklahoma; Illinois jumps to new record

PRODUCTION of crude oil in the United States during the week ended July 29 was at an average rate of 3,558,525 barrels daily. Output at this level was 10,125 barrels less than that of the week before. The delayed effect of lowered July allowables in Oklahoma outweighed gains in Texas and Illinois to bring about the reduction. The Bureau of Mines estimate was overrun 45,325 barrels.

Texas production rose 4600 barrels to 1,354,200 barrels daily, where it was 13,158 barrels under the state allocation and 72,300 barrels less than bureau demand estimate.

California output slumped to 606,600 barrels daily; off 7600 barrels from the week prior and 11,600 barrels above the producer's voluntary proration program. Federal forecast was also exceeded by the same amount.

Percentage changes in the Oklahoma proration program designed to hold production 25,000 barrels daily under the June rate had visible effect in checking production at 433,350 barrels daily, where it was 33,085 barrels less than the week before, and 22,750 barrels under bureau recommendation.

Louisiana lifted 277,000 barrels daily to better the pace of the preceding week by 550 barrels and over-run state and federal allocations by 12,837 and 12,500 barrels respectively.

Illinois moved into the fourth highest production position by raising 287,450 barrels daily, exceeding the week prior by 15,300 barrels and current Louisiana production by 10,450 barrels. Bureau estimate was exceeded 100,050 barrels as the state passed the point which observers had predicted it would not reach till fall.

Kansas held its fastest production pace of several months in turning out 179,375 barrels daily, which is 1300 barrels more than last week's rate, 19,075 barrels over bureau figures and 13,495 barrels over state allowable.

Sealy hearing

Whether the Sealy pool in Winkler County and the North Ward field constitute a common pool will be the subject of a Railroad Commission hearing at Austin scheduled for August 3.

United States Crude Oil Production

Estimates Compiled by THE OIL WEEKLY

DISTRICT OR STATE	Bureau of Mines Estimate of Daily Demand (July)	State Allowable in July	BARRELS DAILY FOR WEEK ENDED July 29	July 22
TEXAS—				
Texas Panhandle	.....	.....	69,050	67,650
North Texas	.....	.....	85,900	82,250
West Central Texas	.....	.....	32,200	32,500
West Texas	.....	.....	242,350	238,500
East Central Texas	.....	.....	95,050	95,850
East Texas Field	.....	.....	377,050	378,600
South Texas	.....	.....	227,500	227,750
Texas Gulf Coast	.....	.....	225,100	226,500
Total Texas	1,426,500	1,367,158*	1,354,200	1,349,600
CALIFORNIA—				
Long Beach	.....	.....	45,300	45,900
Santa Fe Springs	.....	.....	27,200	27,300
Huntington Beach	.....	.....	26,100	26,600
Dominguez	.....	.....	19,400	17,300
Ventura Avenue	.....	.....	36,500	35,900
Midway-Sunset	.....	.....	48,900	54,500
Kettleman Hills	.....	.....	52,300	53,500
Wilmington	.....	.....	73,200	84,700
Others	.....	.....	277,700	268,500
Total California	595,200	595,000‡	606,600	614,200
OKLAHOMA—				
Oklahoma City	.....	.....	99,200	112,975
Seminole Area	.....	.....	102,350	105,225
Fitts	.....	.....	24,430	26,025
Others	.....	.....	207,370	222,200
Total Oklahoma	456,100	428,000	433,350	466,425
LOUISIANA—				
North Louisiana	.....	.....	71,750	71,950
South Louisiana	.....	.....	205,250	204,500
Total Louisiana	264,500	264,163	277,000	276,450

DISTRICT OR STATE	Bureau of Mines Estimate of Daily Demand (July)	State Allowable in July	BARRELS DAILY FOR WEEK ENDED July 29	July 22
ILLINOIS—				
Salem	.....	.....	136,050	131,950
Loudon	.....	.....	69,900	64,900
Other New Pools	.....	.....	73,450	67,200
Old Pools	.....	.....	8,050	8,100
Total Illinois	187,400	.....	287,450	272,150
KANSAS—				
Burrton-Haven	.....	.....	10,375	10,225
Russell County	.....	.....	28,600	27,400
Silica	.....	.....	13,750	14,100
Others	.....	.....	126,650	126,350
Total Kansas	160,300	165,880	179,375	178,075
NEW MEXICO	116,100	116,100	110,200	110,500
EASTERN STATES—				
Pennsylvania Grade	.....	.....	73,050	68,950
Others, Eastern	.....	.....	3,500	3,300
Total Eastern States	.....	.....	76,550	72,250
MOUNTAIN STATES—				
Wyoming	73,200	.....	66,050	62,800
Montana	16,100	.....	16,100	16,000
Colorado	4,800	.....	3,950	4,050
Total Mountain States	94,100	.....	86,100	82,850
MICHIGAN	53,200	.....	68,150	67,400
ARKANSAS	53,900	61,117	61,950	60,950
KENTUCKY	15,900	.....	14,250	14,400
INDIANA	2,600	.....	3,050	3,400
Total United States	3,513,200	.....	3,558,525	3,568,650

* Daily average, considering Saturday and Sunday shutdowns, water exemptions, and exemption at Rodessa and elsewhere.
‡ Recommendation of Central Committee of California Oil Producers' Association.

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STATEMENT OF CONDITION

JUNE 30, 1939

RESOURCES

Cash and due from Banks	$22,215,847.54
U. S. Government Securities	9,376,393.16
Municipal Securities	2,582,183.66
Industrial Securities	678,710.17
Loans and Discounts	19,439,982.35
Overdrafts	384.15
Other Real Estate	1.00
Federal Reserve Bank Stock	120,000.00
Income Earned not Collected	85,265.83
Bank Premises and Fixtures	1,282,434.05
TOTAL	$55,781,201.91

LIABILITIES

Deposits		$50,499,477.43
Income Collected not Earned		117,488.73
Taxes, Interest, and Expense Accrued		111,576.17
Capital	2,000,000.00	
Surplus	2,000,000.00	
Undivided Profits	614,350.78	
Reserved for Contingencies	438,308.80	5,052,659.58
TOTAL		$55,781,201.91

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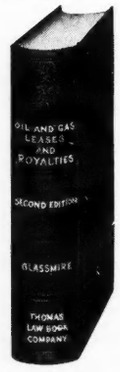

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WEEK'S DRILLING HIGHLIGHTS

Kansas

Conglomerate yielded a 790-barrel discovery 1⅛ miles southeast of Wherry pool in Rice County; Barnholdt, same county, was extended west. Chase was extended ¼ mile west. West Prusa is a new pool for Barton County. Productive limits of Clawson were expanded to within ½ mile of Marchland pool. A Stafford County wildcat had 1400 feet of Arbuckle oil in the hole, while another, south of Leesburgh pool, had a hole full of oil and was testing. Graber, McPherson County, and Morel, Graham County, received extensions, as did Stoltenberg. Other outposts and wildcats reported shows.

Oklahoma

Deese sand was found productive in Doyle pool, Stephens County, while the second completion at Hobart flowed 311 barrels in 14 hours. Hazel pool, Seminole County, was extended ¼ mile. A 9960-barrel completion at Ramsey was believed to have proved up 15 more locations. Skinner sand contained oil in a Payne County wildcat 3 miles west of Norfolk pool.

Southwest Texas

Nueces County's Robstown wildcat developed gas on a production test and will have to perforate lower. A Saxet well attempting to blow out from 9862 feet indicated a new sand. La Rosa, Refugio County, got a ½-mile extension. Jim Wells County reported a new sand for La Gloria and a lower Frio strike on the Wade City structure. Upper Jackson sand is likely to contribute a new Live Oak County field, a wildcat having shown 260 feet of oil and mud in 20 minutes. Several tests showed gas and distillate in a wildcat 3½ miles from La Reforma, Starr County.

Illinois

Showings in two outposts of Gibson field, Indiana, indicate it may cross the state line and run into White and Wabash counties, Illinois. East of production on the Schultz farm in the latter county a wildcat set casing to test 12 feet of Cypress saturation, and southwest of Keensburg another encountered a similar showing. McClosky lime afforded a west extension to Lake Centralia-Salem.

Arkansas

Northeast of Lewisville-Stamps production a mile, a well gave promise of being a producer. Magnolia, Columbia County, registered extensions east and west. A Faulkner County wildcat shut down for orders after getting a shallow gas show.

North Louisiana

First Lower Marine commercial production in Lake Bisteneau, Bienville Parish, was chalked up. The eighteenth Lower Marine completion at Cotton Valley, Webster Parish, extended the field southeast. Southeast of Sligo production a mile, a wildcat showed gas and salt water on test.

South Louisiana

Vermilion Bay prospect was converted into an oil field by a 300-barrel well. Eola field outposts were not looking good. A well indicates Wilcox sand at Villa Platte may underlie a larger area than the Sparta. West Gueydan and Welsh fields were credited with new sands, as were Woodlawn and North Tepetate.

Michigan

Four miles from Walker field, a Tallmadge Township wildcat got 52 barrels of Traverse lime oil per day after a small dose of acid was applied. Another, in Johnstown Township, Barry County, had free oil in Berea sand and cased to 1810 feet for a Traverse lime test.

North Texas

K-M-A got a 3½-mile northwest extension to take the deep lime pay into Wilbarger County. The discovery well for lower Strawn oil in Bonita, Montague County, exceeded expectations when it did 67 barrels in 3 hours.

Comparison of Permits Granted for New Wells

STATE	Week Ending July 29	Total this Mo.	Total this Year	Total this Date Last Year	1938 Year Total
Arkansas	8	27	141	149	247
California	27	80	577	712	1,146
Louisiana	*	93	715	785	1,214
Kansas	36	144	874	908	1,453
Michigan	36	118	777	453	953
Oklahoma	59	168	1,214	1,210	1,978
Texas	180	851	8,239	7,925	12,369
Total	346	1,481	10,383	12,142	19,360

Note: This table in the issue of July 24 was in error in that it showed total permits as of July 23, 1938 as 6,846. Correct total at that date was 11,732 permits.
*Not available.

Summary of Wells Completed in the United States Week Ending July 29, 1939

	Completions	Oil Wells	Gas Wells	Failures	Initial Production	Total 1939	Total this Date 1938
Alabama	....	....	....	....	....	....	2
Arkansas	4	4	....	....	1,243	134	135
California	24	19	1	4	13,812	605	732
Colorado	3	2	....	1	75	15	5
Florida	....	....	....	....	....	....	....
Illinois	79	61	1	17	34,774	2,157	680
Indiana	11	6	....	5	3,070	107	70
Kansas	26	20	....	6	37,246	774	1,011
Kentucky	15	6	1	8	502	367	430
Louisiana	24	14	2	8	4,898	591	638
Michigan	29	17	....	12	10,549	823	488
Mississippi	....	....	....	....	....	6	11
Montana	6	4	1	1	457	76	35
Nebraska	....	....	....	....	....	....	1
New Mexico	11	8	....	3	6,690	363	301
New York	15*	14*	....	1	53	305*	442*
Ohio	20	7	10	3	48	516	548
Oklahoma	34	22	1	11	11,168	1,200	1,297
Pennsylvania	46*	37*	4	5	53	858*	1,376*
Texas	222	148	6	68	72,814	5,755	7,678
Utah	....	....	....	....	....	....	2
West Virginia	11	2	8	1	4	285	409
Wyoming	7	6	....	1	782	76	65
Total this week	587	397	35	155	198,238	15,013†	16,258†§
Total last week	631	427	38	166	168,990	14,426†	15,705†§
Total this year	15,013†	10,226	1,052	3,735	11,501,328	....	.....

* Includes water-input and pressure wells. † Includes 1 Georgia completion. § Includes 2 Tennessee completions.

Oklahoma Fields

Sunray finds Deese sand production in Doyle pool.

Good production obtained from second Hobart well.

Tulsa. — A new deep zone, lower Pennsylvanian, was opened in Doyle pool, Stephens County, as the test swabbed 11 barrels hourly. Hazel pool, Seminole County, was given a ¼ mile north extension and Cromwell sand was being tested on the west flank of the pool. A second well for Hobart pool was brought in after acidizing, swabbing and flowing 311 barrels in 14 hours. The thirty-third producer for Ramsey pool, Payne County, made a potential of 9960 barrels, indicating that approximately 15 more locations are good. In the same county a wildcat 3 miles west of Norfolk pool had a good show with 500 feet of oil in the hole.

Sunray Oil Company found Deese sand of lower Pennsylvanian age productive in Doyle as Hefner 1, SEc NW 12-1n-5w, was deepened to 6000 feet and plugged back to 5650 feet. The sand was drilled from 5650 to 5745 feet, where it has been swabbing about 11 to 12 barrels hourly, with mud from the formation contaminating and lengthening the clean-out job, which will require about three days. This formation is in the same series that opened West Doyle pool this year. Hefner 1 was initially drilled to 3816 feet after a new zone on the east side of the pool was discovered. Helmerich and Payne's Graham 1, SWc NE 12-1n-5w, offsetting Hefner 1 to the east, will be deepened for testing the new zone. Phillips Petroleum Company's Coombs 1, SE SW NE 4-1n-5w, West Doyle pool, was drilling below 6335 feet, apparently missing the pay horizon.

Near Hobart, Shell Oil Company acidized with 2100 gallons from 1092 to 1105 feet and with 1000 gallons from 1063 to 1082 feet in the Pontotoc formation to bring in Ratcliffe 1, SEc NE 19-7n-17w. The well swabbed and then flowed 311 barrels of oil in 14 hours and has been shut in for lack of storage. It offsets Gled Oil Company and Russell Tarr's Watkins 1, to the west. Of other tests in the area, Hagerling et al's Kimray 1, SWc NW 36-5n-18w, 1½ miles northwest of Roosevelt, which had a show of oil and gas was testing at approximately 1100 feet.

Hazel Extended

An extension ¼ mile north was given Hazel pool, Seminole County, as Wood Oil Company and Mid-Continent Petroleum Corporation's Tobin 3, NE NW NW 22-7n-5e, made 102 barrels in 11 hours through tubing from a plugback depth of 3000 feet, testing sand at 2700 feet. These companies have made location for Ashley 3, NW NE NW 22-7n-5e, an east offset. Off the west flank of the pool, Commercial Drilling Company was shutting off water to test Cromwell sand carrying good saturation at 3050 to 3083 feet. It is the first well to encounter this formation in the pool.

Northwest of Wetley pool and offsetting the recent Burton discovery in SW NW SE 3-5n-5e, Culver and Shepherd's Breco 1, NWc 10-5n-5e, had a show of oil in Calvin sand at 1448 to 1468 feet and was checking structurally higher than the Burton well, which made 30 barrels hourly from Oolitic Hunton lime at 2666 feet.

Mid-Continent Petroleum Corporation et al's Brandon 5, SW NE NE 13-18n-1e, made the thirty-third producer for Ramsey pool, Payne County, flowing 9960 barrels over a 24-hour period from first Wilcox sand topped at 4870 feet and drilled to 4891 feet. This indicates approximately 15 locations are good and will move the pool northwest.

A wildcat had a show of oil above the Skinner sand, 2995 feet, three miles west of Norfolk pool and the same distance south of Yale-Quay District, Payne County. Olson Oil Company and Conrad Lambert's Minnich 1, NE SW NE 3-18n-6e, plugged back from dry Wilcox sand at 3584 feet, found lower Skinner dry and tested the upper to get the show. The Texas Company completed the thirteenth producer for Coyle pool in their L. M. Graham 3, C E½ SE SW 12-17n-1e, flowing 10 barrels hourly, the low potential due to lack of gas and nonuniformity of sand porosity high on the structure. Magnolia Petroleum Company's Cain 4, C E½ NE SW 12-17n-1e furthest west test on the structure found second Wilcox sand dry and will plug back to the first sand topped at 4865 feet to try for a small well.

Wildcatting was at a low ebb as the week ended with 4 going on the list as dry. In Harper County Sinclair Prairie Oil Company abandoned George 1, SWc 5-27n-23w, near Buffalo, at 7420 feet in Mississippi lime. No shows were encountered, leaving the Western Oklahoma Basin in the dark as to possible production. One-half mile east of Meridan pool, Logan County, Wilcox Oil & Gas Company plugged Parrish 1, NWc SW 26-16n-1e at 5273 feet in the Wilcox

Oklahoma Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Caddo—		
Stephens, Curtis 1, se sw ne 26-6n-10w	22	2130
Carter—		
Kyle, Daugherty 7, nw nec sw 17-4s-2w	22	2315
Comanche—		
Roddy, Franzee 3, nw swc se 29-2n-10w	2	435
Creek—		
Bailey, McSoud 1, swc ne 31-17n-10e	148	2720
Darby, Anthis 1, sw se sw 19-19n-9e	*	3118
Tibbins, Jones 1, se sec nw 18-14n-9e (otd 1262 ft)	10	2385
Bell, Stanley 2, nw nw sw se 33-18n-10e	*	2669
Garfield—		
Sinclair Prairie, Hoy 25, nw se nw ne 25-22n-4w	4	1120
Jackson—		
Burnham, Sumner 1, nw sw ne 6-1s-19w	65	2592
Helf, Thompson 1, sec 5-1s-21w	Abnd.	Lcn.
Kay—		
Tide Water, Kelley 1, sec ne 27-28n-1w	*	3706
Roy Star, State 1, nec sw 13-29n-2w	*	4075
Lincoln—		
Yorkan, Tipkin 1, c sw nw 15-13n-6e	1200	4300
Stanolind, Clark 1, swc ne 35-15n-2e	*	4500
Logan—		
Sinclair Prairie, Crews 2, se nw ne 27-16n-1e	1085	5191
Muskogee—		
Swick, Millison 2, ne ne sw ne 32-15n-15e	*	2060
Okfuskee—		
Shell, Johnson 8, nwc ne 11-11n-8e	23	3380
Stekoll et al, Finks 1, nw se nw 25-10s-11w	*	2115
Osage—		
Branstetter, 1, ne nw ne ne 32-22n-11e	25	925
Harrop, 5, se sw se nw 17-22n-12e	7	1725
Pawnee—		
L&L, Sills 1, sec nw 5-20n-9e	*	2860
Payne—		
Mid-Continent, Brandon 6, nec 13-18n-1e	7344	4853
Pontotoc—		
Lake Oil, Summers "A" 4, swc 25-5n-4e	40	2505
Pottawatomie—		
Black Gold, Terrell 1, c nw nw 14-7n-3e	190	4347
Berkey, Owens 1, ne se se 21-7n-4e	*	4204
Eagle, Green 2, sw nw se 29-7n-5e	100	4132
Rose, Davis 1A, nw ne se 19-7n-4e	*	3640
Portable et al, Boyd 1, sw ne se 29-7n-5e	150	4127
Seminole—		
Sunray, Keys 2, sw nw se 12-6n-5e	480	3818
Villines, Millsap 2, sw nw sw 23-7n-5e	120	2800
Malernee, Swan 4A, se nw ne sw 33-7n-6e	*	942
Shaffer, Owens 1, c n½ se ne 18-8n-6e	48	4180
Phillips, Bethel-Unit 2, se nw ne 7-9n-8e	28	2785
Stephens—		
Branard, Gilmore "B" 4, ne nwc se 10-2s-5w	¶0.6	1065
Jackson, Warden "B" 5, sw nw sw ne 34-1s-5w	5	498
Tillman—		
I. T. I. O., Fillmore 1, swc se 36-2s-19w	50	5141

•Failures; †Junked; ¶Mil. cu. ft. gas.

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sand. A good show of gas in Hunton lime was topped at 4949 feet.

To Test Structure

New wildcats started include J. E. Crosbie, Incorporated et al's Robbins 1, Noble County, SSc NW 6-22n-2w, 4 miles southwest of Billings pool in an area core drilled and seismographed earlier in the year to disclose a structure thought to be a trend of the Billings-Tonkawa. Drilling is to be under way the latter part of August. Lease holders in the area are Phillips Petroleum Company, Tide Water Associated Oil Company, Anderson-Prichard Oil Corporation, Fanoma Oil Company, Ohio Fuel Company, George E. Failing, L. H. Wentz, Gulf Oil Corporation, Champlin Refining Company, Mid-Continent Petroleum Corporation, Blackwell Oil & Gas Company, J. R. Pierce and George Pasquella.

In Carter County, The Pure Oil Company discovery well, Noble 1, C NE SE 35-3s-1e, pumped 100 barrels of oil and 3 barrels of water in 24 hours from perforations at 4150 to 4234½ feet in a lime formation.

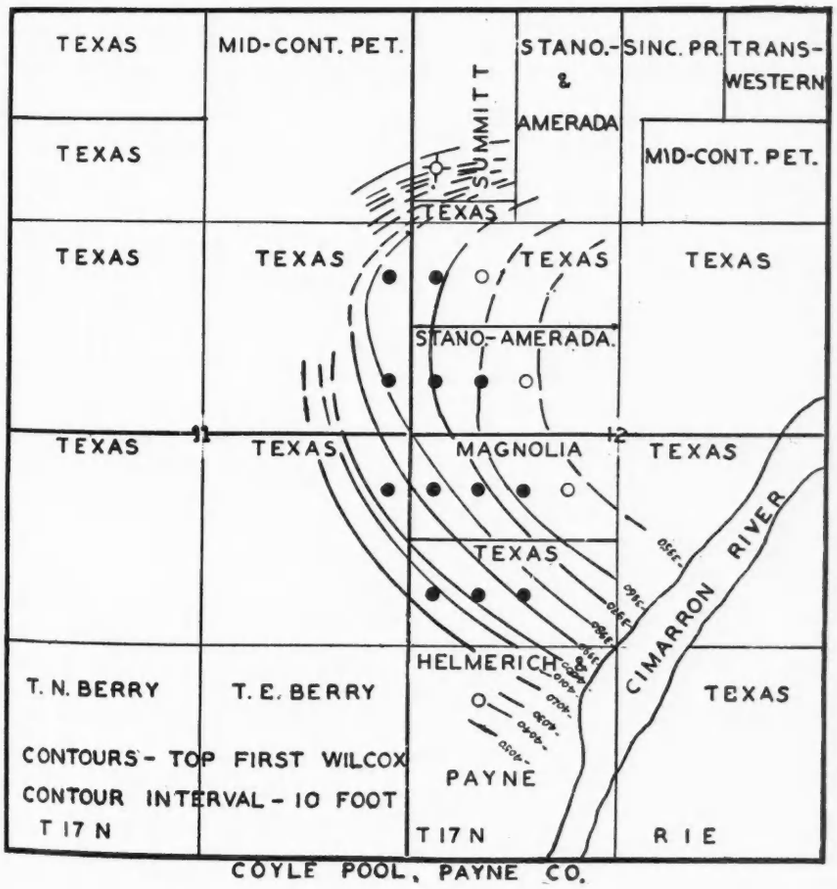
Drilling as the deepest test in Oklahoma today, Continental Oil Company's Proctor 1, C NW 28-10n-20w, was below 13,695 feet.

Orderly development of Coyle pool in Payne County reveals important oil reserve

Recent developments in Coyle pool, Payne County, Oklahoma, have enhanced the reserves for the state, following an orderly drilling program.

Location was made for The Texas Company's Longon 1, C W½ NW NW 12-17n-1e, discovery well, on March 30, 1938. The test was drilled to 5006 feet in second Wilcox sand and plugged back to 4965 feet after electric log showed good saturation in first Wilcox sand and Hunton lime. Seven-inch casing was cemented at 4807 feet, in Viola, and 2½-inch tubing run to 4944 feet. Initially the well flowed 275 barrels in 6½ hours from first Wilcox while the tubing was being run, then the well was shut in for pipe line connections. On November 1 it was opened and completed November 21, 1938, for 450 barrels per day through 3/16-inch choke on tubing, averaging 150 barrels daily for the allowable. Offsetting this well to the north, Summitt Oil Company drilled a dry hole in Johnson 1, C W½ SW SW 1-17n-1e, at 4963 feet, topping first Wilcox at 4947 feet.

Thirteen wells now comprise the



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Other Patents Pending

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area, having a total initial potential of 6067 barrels daily. The structure noses sharply to the northwest although the trend is yet to be completely defined. The best wells are found on the flank of the nosing. Highest well structurally is Magnolia Petroleum Company's Cain 4, C NE SW 12-17n-1e, an east offset to Cain 3. The test has been swabbing about 10 barrels a day from first Wilcox although operators are drilling for the second sand as practically no gas is accompanied with the oil. Probability remains the well may make a small producer although it was somewhat discouraging. Helmerich & Payne's Collins 1, C E½ NW NW 13-17n-1e, a south offset to The Texas Company's L. M. Graham 2, ran pipe in the Viola after electrically surveying the hole. This is the southernmost test for the pool.

The Texas Company, Magnolia Petroleum Company, Stanolind Oil & Gas Company and Amerada Petroleum Corporation are the principal lease holders in the pool, with Mid-Continent Petroleum Corporation, Helmerich & Payne, and T. E. and T. N. Berry holding adjoining acreage.

Seven-inch casing is cemented above the pay and 2½-inch tubing is run in the Viola lime before final completion. Majority of the wells had several million cubic feet of gas with the oil, making natural producers. On drill-stem tests the Hunton lime showed up well, offering another horizon for future testing. Collins 1 found the Layton series saturated from 3440 to 3494 feet to indicate a third zone for the pool.

The oil is 43-gravity.

Kansas Field Developments

Shaffer and Carlock bring in new pool near Wherry.

West Prusa discovery earns 527-barrel potential.

Wichita.—Designation of 2 new pools for Kansas as well as extension for 6 other areas saw activity boom over the week end. A slight decrease in wildcatting over the previous week was evident.

E. J. Shaffer and C. L. Carlock et al's Bauer 1, C W½ SW SW 23-21s-7w, 1⅛ miles southeast of Wherry pool, Rice County, was officially completed for 790 barrels daily from Conglomerate at 3402 feet. The area has been named South Wherry pool.

Chase pool was extended ¼ mile west as Phil-Han Oil Company et al's Haxton 1, SW SE NE 30-19s-9w, filled 1200 feet with oil from 3280 feet in Arbuckle lime, topping the formation at 3259 feet.

Skelly Oil Company's Bernstorf 1A, C SE SE 22-19s-10w, which previously extended Silica pool ½ mile northward, rated a potential of 734 barrels in 24 hours after acidizing Arbuckle lime topped at 3281 feet and drilled to 3294 feet. Two tests starting for the area are Skelly's Ira 1, C S½ SW NW 27-19s-10w, and McGuire 1, SWc NE 34-19s-10w.

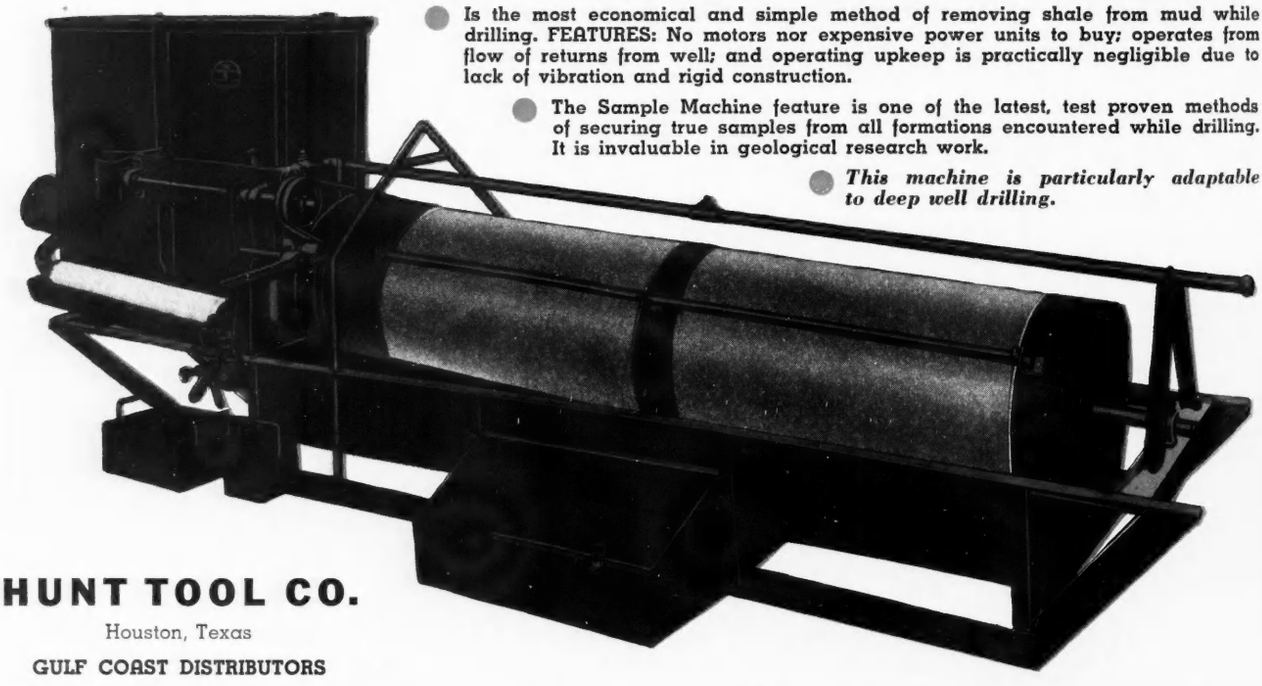
West Prusa pool, Barton County, went on record as M. B. Armer and Vernon Oil & Gas Company's Hoffman 1, NW SW 18-16s-11w, 2 miles northwest of Prusa pool, made a potential of 527 barrels from Lansing-Kansas City lime at 3217½ feet, after acidizing.

Frank Hollow et al's Schwartz 1, C E½ SE NW 18-20s-11w, which extended Clawson pool to the west, made 107 barrels on a 24-hour period from lime topped at 3296 and drilled to 3335 feet, bringing the pool to within ½ mile of Marchland.

Barnholdt pool was moved to the west as Bradley Brothers et al's Carlson 1, SE NE NE 36-20-8w, Rice County, flowed 62 barrels of crude in 45 minutes from 3327 feet in the Chat formation. A production test is being made. Two locations away, Fain Drilling Company et al's Johnson 1, CWL NE 31-20s-8w, topped the Chat pay at 3281 feet and ran an oil string prior to drilling in.

A mile northwest of Mueller pool,

THOMPSON SHALE SEPARATOR and SAMPLE MACHINE



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THOMPSON TOOL CO., Inc. **IOWA PARK TEXAS** **PHONE 30**

S. A. Murphy, Virginia Drilling Company et al's Teiperman 1, NEc SW 29-21s-12w, Stafford County, had 1400 feet of oil in the hole from 3617 feet in Arbuckle lime at 3617 feet. Five feet deeper the test swabbed 2 barrels hourly after acidizing with 500 gallons. Plans call for reacidizing before taking potential. The test lies between Fischer and Sittner pools. South of Leesburgh pool, Continental Oil Company's Russell 1, NWc SE 13-25s-13w, had a hole full of oil and was testing at a total depth of 4125 feet.

Graber pool, McPherson County, received a ¼-mile extension west in W. C. McBride, Incorporated's Heintzleman 1, SEc NE 30-21s-1w, which pumped 60 barrels on a 24-hour test from Hunton lime at 3293 to 3326 feet. Some water is accompanying the crude; McBride will plug back and acidize when the shutoff is completed.

Making 376 barrels daily from Arbuckle lime at 3732 feet, Continental Oil Company's Clark 1, C E½ E½ SW 10-9s-21w, moved Morel pool, Graham County, ½ mile northwest.

I. W. Murfin, Ewers-Simpson Oil Company and Atlantic Refining Company's Loula 1, NWc SE 28-16s-10w, a mile southwest of Stoltenberg pool, pumped 37 barrels of oil in 3 hours from Arbuckle lime at 3301 feet. After acid treatment it made an official potential of 640 barrels daily to extend the pool.

In Russell County, Phillips Petroleum Company's Maier 1, SWc NE 15-15s-14w, 1¼ miles northwest of Trapp pool, may be designated a discovery. The test made a potential of 272 barrels from Arbuckle lime at 3248 feet.

Testing was underway at Phillips Petroleum Company's Carroll 6. C E½ NW SE 18-14s-14w, ¼ mile west of Vaughn pool and a mile east of production in Niedenthal pool. It had a good show of oil in Gorham sand from 3290 to 3299 feet.

West of production in Brown pool, Cowley County, J. L. Henderson et al's Clover 1, SEc NE 8-31s-7e, was shut in at 2223 feet after getting a gauge of over 1,600,000 cubic feet of gas.

Kansas completions show high initial average

Wichita.—Kansas completed 20 oil wells over the past week for a total initial potential of 37,246 barrels, averaging better than 1800 barrels per well. No gas wells were completed and 6 dry holes resulted. Wells started held on par with the previous week at 36 locations staked during the period. The lead went to Russell County with 9, followed by Rice with 7, Cowley 4, Stafford 3, Barton, Butler, Ellis, Greenwood and Marion 2; Ellsworth, Johnson and Sumner 1 apiece.

Kansas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Barber—		
Barber, Holmes 3A, se ne nw se 15-33s-13w	551	4868
Barton—		
B. B. & M., Esfield 1, nwc se 28-16s-11w	5189	3345
Stanolind, Schwartz 11, csl sw nw nw 2-20s-11w	1618	3291
Butler—		
Gulf, Shumway 54, sw ne ne 11-26s-4e	30	1707
Cowley—		
Cities Service, Waite 2, ne sw nw 21-31s-4e	3333	3383
Blair et al, Dunlap 3, se nw ne 21-32s-5e	624	3064
Hartman et al, Waite 10, nw se sw 21-31s-4e	4271	3315
Ellis—		
Phillips, Hendricks 1, 116 ft e nw ne ne 13-11s-18w	3500	3377
Ellsworth—		
Continental, Baker 2, swc se 21-17s-8w	84	3240
Greenwood—		
Oko, Shedel 16, nw swc se 15-23s-13e	15	1854
Sheedy, Fee 1, c e½ ne nw 13-25s-12e	*	1755
Johnson—		
Sagamore, Squires 1, se se sw sw 16-14s-22e	*	985
McPherson—		
Dickey et al, Williams 1, nec nw 26-19s-2w	20	3127
Reno—		
Westgate-Greenland et al, Swanson 1, ne nw ne 1-23s-5w	*	3967
Rice—		
Finston & Co. et al, Hathaway 1, c n½ nwc sw 27-19s-10w	2436	3050
Cities Service, Zajic 3, nec se 11-18s-8w	*	3288
Mid-Plaines, Engelland 1, csl se nw se 15-21s-7w	437	3385
Russell—		
Stearnes et al, Olson 1 "C," nw ne nw 27-14s-14w	3192	2993
Southern, Sellens 3, sw se nw 29-15s-13w	1360	3300
Braden et al, Blehm 1, swc nw 11-14s-14w	*	3300
Aylward, Hall 4, swc 22-14s-14w	2585	3365
Carter, Sellens 2, nec sw 17-15s-13w	1938	3229
Gulf, Mollie 10, swc se 25-15s-14w	3899	3290
Cities Service, Tittle "D" 3, sec ne 14-15s-14w	894	3345
Stafford—		
Stanolind, Hays 8, cs½ nec se 11-24s-11w	1270	3758
Woodson—		
Woodson P. L. Co., Williams 1A, se swc se 7-24s-14e	*	1744

*Failures; †Junked; ¶Million cu. ft. gas.

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Illinois Developments

Indiana field shown extending to two Illinois counties. Lake Centralia-Salem extended west by good oil producer.

Mattoon, Ill.—Illinois oil interest infringed upon Indiana last week when two near completions indicated the Griffin pool of Gibson County, Indiana, may be developed into a producing area 12 miles long and take in parts of two Illinois and one Indiana county.

On the southwest end and in White County, Illinois, T. C. Chisum's T. E. Boultinghouse 1, SW SW 10-4s-14w, had casing set to more than 13 feet of Cypress sand saturation. No announcement was forthcoming as to when plug would be drilled. Twelve miles to the northeast—the line running through several recent Wabash County, Illinois, producers and the Griffin pool on the Indiana side of the Wabash River—C. D. Neff's A. P. Bump 1, NW NE NW 9-2s-13w, Keensburg Township, Wabash County, was flowing by heads after plugs were drilled to 16 feet of Cypress sand saturation, topped at 2403 feet. Reliable production estimates ranged from 500 to 700 barrels a day.

With the Bump wildcat northeast of the town of Keensburg, a townlot drilling campaign loomed with spudding of Harry Fotiades' Fred French Elevator Lot 1, near the center of town. On the southwestern edge of the town and on a 6.8-acre tract, W. S. Tatum's Lawrence Williams 1, N½ NE 17-2s-13w, was moving in rotary rig.

Three miles southwest of Keensburg and just east of production on the Bertha and Anna Schultz farm in Wabash County, Finston et al's D. Elkins 1, N½ SW SW 29-2s-13w, had casing set to 12 feet of good Cypress sand saturation, topped at 2475 feet. Also southwest of Keensburg and near the Wabash River, W. E. Witt et al's Ben Schuh 1, SW SW 31-2s-13w, was waiting on cement for a test of 12 feet of Cypress sand. Offsetting Schuh 1, 400 feet west, Harry Randall's C. D. Elliott et al 1, NW SW SW 31-2s-13w, was drilling below 1300 feet.

On the southwest end of the 12-mile stretch, Chisum 1 was offset to the west by Ray Johnson's F. M. Hon 1, NE NE SE 9-4s-14w, White County, which was drilling below surface pipe.

White County firmly entrenched itself in the Illinois oil development program when Nation Oil Company's B. McIntosh 1, C NW SE SW 31-3s-8e, Mill Shoals Township, flowed slightly more than 1000 barrels in a 24-hour period. Production was from the Aux Vases sand, with bottom at 3258 feet. The formation was topped at 3210 feet, and while the first 16 feet were too tight the well had about 25 feet of good pay. On the northern edge of the county, Mill Shoals Township is just south of Barnhill Township of Wayne County, which has the Barnhill pool.

Also in Mill Shoals Township, Kingwood Oil Company's Tullis 1, C E NE NE 29-3s-8e, set 5-inch casing to the top of doubtful looking McClosky pay, topped at 3440 feet. Sun Oil Company's John Garner 1, C 1-5s-10e, took a core from the Tar Springs which was mostly shale and was drilling on below 2400 feet.

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In the Sandoval deep Niagaran lime pool, Mizner & Finegan's (Baldwin's) Schafnit 1, SW SE 4-2n-1e, was waiting on cement after setting casing to near the top of the lime, at about 2900 feet. An east outpost to this small producing area, the well will be drilled into the Niagaran, which had not yet been topped, with cable tools. The same completion procedure was to be followed nearby at Max Pray's Robinson

Illinois Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Clay County—		
Pure, Priestman 4A	475	3085
E. R. Priestman 5A	105	3125
Holmes Consolidated 2	1018	3135
Taylor Consolidated 2	607	3085
R. B. Moseley 4A	387	3045
T. H. Tetrick 11A	197	3040
Clinton County—		
Elmer Goldschmidt, Burger 1	*	1302
Fayette County—		
Max Conrey, Roy Malan 1	*	1432
Shulman Bros., Combe 5	*	1603
Combe 7	200	1565
Rosenthal, Washburn 11	165	1577
Central States, Owens 4	175	1466
Sigel et al, Owens 3	*	1525
Barney Whisenant, Lilly 8	125	1529
Whisenant et al, Lilly 9	250	1577
Carter Oil Co., Owens 1	245	1574
Ed. Harper 2	136	1562
O. Harper 6	64	1579
Cora Miller 1	24	1570
Ella Huffman 2	132	1606
Sirilous Musser 1	102	1588
Anna Sloan 2	138	1549
Bob Fortner 4	348	1601
Bob Fortner 5	350	1600
William Holley 3	224	1544
Lem Lilly 2	700	1546
Lem Lilly 3	492	1525
Lem Lilly 4	474	1567
Joe Tipsword 2	696	1591
Dorothy Miller 1	*	1614
Franklin County—		
Palacine Oil Co., Old Ben 1	*	3097
Jasper County—		
Thompson Dr. Co., Union Central 1	*	2500
Jefferson County—		
Kingwood Oil Co., C. E. Cook 1	*	3204
McDonough County—		
William Fraut, George Kruse 1	*	677
Macoupin County—		
American Pet. Corp., Hilyard 1	¶.13	448
Marion County—		
Bell Oil Co., Albert 2	*	2143
W. C. McBride, Fyke 6A	*	1670
N. Lee 11	3927	2033
W. Gross 1	*	2307
Texas Co., Bryant 10	224	2070
City of Centralia 33	651	2070
City of Centralia 34	210	1872
R. Lankford 3	154	1845
G. Seibel 2	210	1890
G. Seibel 3	280	1889
J. Williams 6	588	2073
E. Snyder 2	154	2160
J. Chapman 8A	280	1817
J. Chapman 11	851	1848
J. Chapman 12	1911	2008
J. Chapman 13	749	2073
N. Lee 9	301	1830
N. Lee 11	3927	2033
N. Lee 12	1960	1997
N. Lee 13	1050	2045
N. Lee 16	2400	2036
Tide Water Associated, Miller 5	360	2082
Max Pray, Cole 5	50	2091
Potter Bros., M. & I. R. R. 7A	45	2108
Arthur Harvey, Kagey 1	250	2248
Monroe County—		
Ames Oil, Gummershimer 3	30	432
Perry County—		
C. H. Blankenship, Rheinecker 1	*	1350
Richland County—		
Pure, Storer 1A	200	3025
Shimmer et al, School Lot 1	72	3039
St. Clair County—		
Strickler, Frye 2	20	700
Hempen et al, Thielman 2	45	683
Wabash County—		
W. M. Bartlett, Stansfield 1	210	1719
Washington County—		
Zephyr Dr. Co., Long 1	*	1899
W. R. Curry, Krughoff 1	*	1305
Magnolia, Kurwicki 3	48	1291
Manitou Pet. Co., Kurwicki Roadway 4	60	1284
Shell, Holston 6	92	1281
Wayne County—		
Pure, McCracken 3A	286	3095
Leona McCracken 2A	60	3148
W. B. McCracken 1B	987	3138
Andy Bruner, Kuyoth 4	64	3025
Horn et al, Flanders 1	*	1650
H. H. Weinert, Sprague 2	1000	3274
New Pennsylvania Dev. Co., French 1	*	3438

*Failures; †Junked; ¶Million cu. ft. gas.

1, SW SE SW 4-2n-1e, where pipe was set to 2985 feet.

Menhall et al's Benoist 2, SE NE NW 8-2n-1e, was drilling below 2500 feet; Southwestern Oil & Gas Company's Benoist 22, NE NE NE 8-2n-1e, was attempting to drill around tools lost at the Benoist sand level, and E. C. Hines' Hazelwood 1, 900 feet south of the Benoist 2, resumed drilling below 1800 feet after a shutdown of several weeks. While opened up during a 24-hour period last week, Menhall et al's Benoist 1, which confirmed the pool several weeks ago, flowed 1400 barrels.

Lake Centralia-Salem Extended

W. B. Dallas' Flannigan 1, SE NW SW 30-2n-2e, furnished a slight west extension to the Lake Centralia-Salem pool of Marion County when completed in the McClosky lime. Cleaning out after a 4000-gallon acid treatment, it was showing for a good producer. Of Marion County wildcats, Papoose Oil Company's J. I. Weems 1, NE NW SW 20-1n-4e, Romine Township, was drilling below 1100 feet, while Quisenberry Drilling & Production Company's E. F. Hawkins (Ferris) 1, NW NW 32-1n-4e, Romine Township, was preparing to spud.

Kingwood Oil Company announced McWhorter 1, C E SE NW 15-6n-6e, Union Township, Effingham County, would be abandoned. It had been producing about 10 barrels of oil along with 40 barrels of water from the St. Louis lime, topped at 3028 feet; having been plugged back from 6543 feet, the Prairie du Chien lime. The wildcat is the deepest hole thus far put down in Illinois.

In Gallatin County, Kingwood Oil Company's Egyptian Tie & Lumber Company 1, C S½ NW NE 15-8s-10e, New Haven Township, set 7-inch casing to 20 feet of shaly Cypress saturation, only about 5 feet of which looked promising. This company's Jessie Oliver 1, NW NW 11-10s-6e, was drilling below 2400 feet.

In Richland County, Leathers et al's Roy Milone 1, NW NW NE 21-3n-14w, Claremont Township, successfully completed a fishing job at 2310 feet and resumed drilling. It is the only wildcat currently active in that county.

Jasper County was left without an active operation when Thompson Drilling Company abandoned Union Central Life Insurance Company 1, C SE SE SW 14-8n-10e, Crooked Creek Township, at 2500 feet after passing through a dry McClosky.

Carter Oil Company, which has been following a 20-acre spacing program in the Eastern Fayette County pool, has been forced to adopt a 10-acre development program for the southern section of the field. With the company's holdings broken up by independents, many of whom are pumping their wells to capacity, Carter Oil Company is unable to extend its repressuring system to the southern end of the pool. The company has been prorating its wells to 40 barrels daily.

Leasing activity, which has been

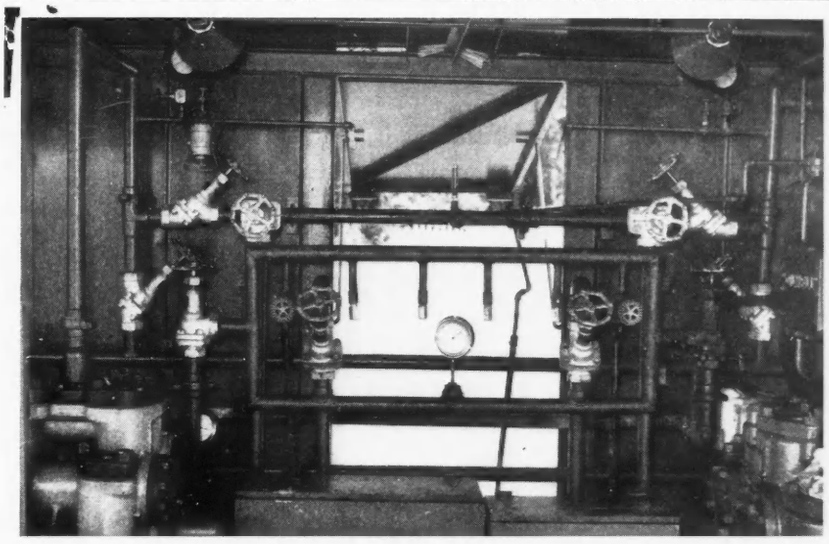
New York Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Steuben County—		
G. L. Cabot, Inc., C. Crane 1	*	3960
Allegany County—		
J. A. Bucher, Hamsher farm, Bolivar	4	1266
Harder-Bradley Oil Co., Clare-Rhodes farm, Alma	7	1290
Otsquago Oil Corp., Pike farm, Alma	8	1430
Bradley Prod. Corp., Breckenridge farm, Alma	9	1360
L. E. Norton Est., Coats farm, Scio	4	1235
Fords Oil Co., Frederick farm, Alma	6	1342
L. H. Thornton et al, Shaughnessy farm, Willing	6	1338
H. W. Patterson et al, B. S. Clark farm, Scio	5	957
Bradford Prod. Corp., Willetts farm, Genesee	4	1390
Allegany: Water Intake Wells		
W. J. Richardson Est., No. 3, Gadsby farm, Alma	..	1438
Pure Penn Pet. Corp., Christman farm, Bolivar	..	1472
Forest Oil Co., Ackerman farm, Bolivar	..	1416
C. Christman & Son, Underwood farm, Scio	..	1364
Bohne Bros., Matena farm, Willing	..	1260

West Virginia Completions

Boone County—		
Hope Natural Gas Co., Miller 7841	¶.74	1950
Owens-Libby-Owens Gas Co., Chambers 1	¶.10	....
Cabel County—		
R. H. Adkins, Bledsoe 1	¶.50	1668
Fayette County—		
Northeastern O&G Co., Colliery 4	¶1.00	1703
Gilmer County—		
Pittsburgh & W. Va. Gas Co., Simmons 7669	¶.09	1975
Kanawha County—		
Meigs Dev. Co., Higgenbotham 1	¶1.31	4971
Lincoln County—		
Harmon Gas Co., Lovejoy 1	¶.23	3560
Mingo County—		
Virginian G&O Co., Logan Channel Coal 4443	¶.03	1787
Wayne County—		
Owens-Libby-Owens Gas Co., Hayes 2	*	....
Wetzel County—		
J. T. McIntire, Lemasters 2	3	3331
Wood County—		
Biddel & Gabbert, Anderson 1	1	1442

*Failures; †Junked; ¶Mil. cu. ft. gas.



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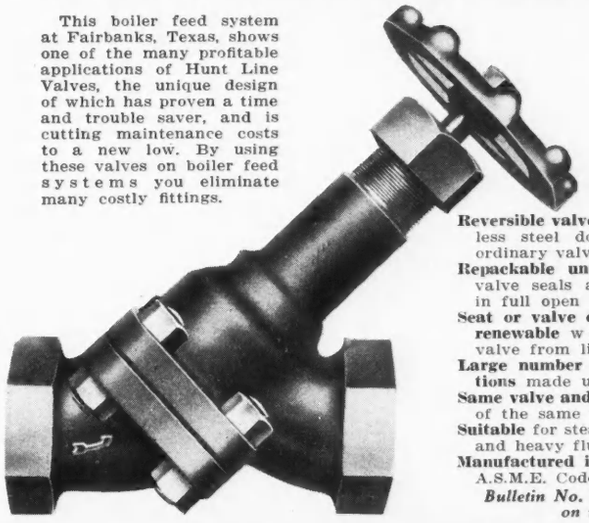

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Field Shops: Bay City and Corpus Christi, Texas; Jennings, Houma and Shreveport, Louisiana
A BUSINESS BUILT ON SERVICE

growing in northeastern Illinois in recent months, has extended to the northwestern part of the state where efforts are being made to assemble a block of 10,000 acres in the vicinity of Rodden and Galena in Jo Daviess County.

Illinois map

The Illinois State Geological Survey Division has announced issuance of a Geologic Map of Illinois, prepared on a scale of about 8 miles to the inch. It was compiled by J. M. Weller, with the assistance of other members of the survey staff.

Blue-line prints are being supplied at 50 cents each, with orders being taken by Enid Townley, map agent of the survey, Urbana.

Indiana Activities

Griffin mile extension well rated 1500 barrels daily. 4,500,000 acres under lease in southern part of state.

Evansville, Ind.—One mile southwest of production in the Griffin pool, Continental Oil Company's Bozeman Land Company 1, SW SW NW 24-3s-14w, Wabash Township, averaged 62.5 barrels an hour for 5½ hours through 2½-inch tubing. It is rated at 1500 barrels daily. Production is from the Cypress sand, 30 feet of which was topped at 2507 feet.

Gwin Drilling Company's W. L. Skiles et al 1, NW SW NE 18-3s-13w, Wabash Township, midway between production in the Griffin pool and W. F. Lacy's producing George Heston 1, NW SW NE 8-3s-13w, 2 miles east of other producers, was unable to remove stuck drill pipe at 2389 feet and operators gave up plans to whipstock past the obstruction. The rig was being skidded 25 feet north for a new hole. Offsetting Heston 1 to the west, Tide Water Associated Oil Company's M. P. Kelly 1, SE SE NW 8-3s-13w, was drilling at 1200 feet.

(The relation of Griffin pool production to recent developments in Wabash and White counties, Illinois, is dis-

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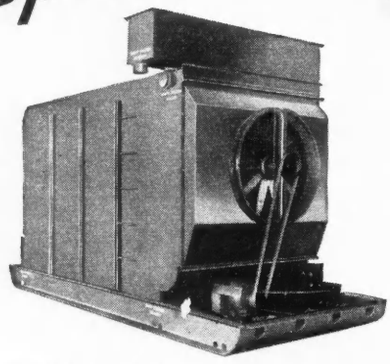

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Rapidly coming into prominence as the most efficient and economical method of cooling soft jacket water for 300 to 800 h.p. engines which must be moved to new locations at intervals, these portable units provide many new advantages for saving time, trouble and money through better engine performance.

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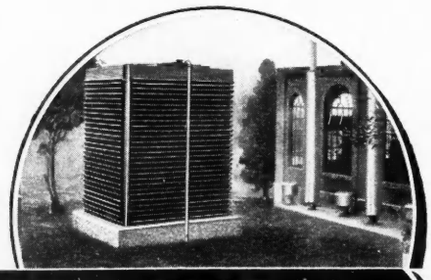
For Drilling, Permanent Pumping and Pipe Line Service

In addition to serving on drilling jobs, this MARLEY unit is used for pumping and pipe line work as well. For this type of service, either open or closed systems, Marley Spray and Spray Coil Towers are in wide use.

For every phase of oil production, MARLEY engineering produces the correct type of water cooling equipment, geared to the specific requirement. The two types shown below are widely used in drilling—and are known in the oil fields for their dependable, economical service. Whatever your needs may be—in drilling, pumping, pipe lines or refining, MARLEY will do the job *right!*



The MARLEY Co.
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Kansas City, Kans.

Indiana Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Dearborn County—		
Lawrenceburg Gas Supply Co., Fee 2	*	....
Gibson County—		
Continental, Cooper 2	500	3185
Bander et al, Cooper et al (Hughes 4)	500	2884
Cleary & Thorp., Ballard 1	*	2111
Lewis & Armstrong, Blair 1	*	2353
Jay County—		
F. C. Weaver, Grisell 1	*	1037
Posey County—		
Illind Oil Co., Sophie Schenssler (Stroud) 2	2000	1878
Sun, J. J. Heil 3	30	1875
Spencer County—		
B. K. Maitland, Grass 1	20	842
Vigo County—		
Siosi Co., Nevins 1	20	2135
Warrick County—		
Dye & Walsh, Wilson 1	*	2000

Pennsylvania Completions

Armstrong County—		
J. Wray et al, Guthrie 1	¶.07	3415
Fayette County—		
Duquesne Gas Co., P. Demaske 1	*	2621
Indiana County—		
T. W. Phillips G&O Co., Fry 1	¶1.22	3192
J. Stuckell 1	¶.10	1301
BRADFORD DISTRICT		
C. M. Lippert et al, Lippert	3	....
First Nat'l Bank, Port Allegany	7	....
Penn Valley Crude Oil Corp., Redfield	6	....
D. W. Daly, 369 Bing	2	....
Bring & Brink, Bing 268	2	....
Forest Oil Corp., 3 wells	3	....
Forest Petroleum Corp., 4 wells	4	....
Niagara Oil Corp., 7 wells	7	....
Bradford Transit Co., 10 wells	10	....
Bradford: Water Intake Wells		
Grant & Mohan Oil Co., No. 3, Bing 484-5-6-7	...	....
Esther Oil, Inc., Lawton	...	....
Forest Oil Corp.	...	....
Forest Petroleum Corp., 2 wells	...	....
Niagara Oil Corp., 2 wells	...	....
Butler-Armstrong District		
Ray Peters, C. P. Benninger	5	....
Middle District		
S. H. Elder & Co., Hamlin	2	....
Warren Bank & Trust Co. Reynolds	2	....
Dr. Abrams, Van Guilder	*	....
New York-Pennsylvania: Gas Field		
Updegraff, Norman Patterson	*	..
Empire Producing Co., Nelson Kemp	*	....

*Failures; †Junked; ¶Million cu. ft. gas.

cussed in the Illinois Developments section on page 206.)

Two failures marked wildcat activity of the week, both in Gibson County. Pete Thorp and J. K. Cleary's J. P. Ballard 1, NE NE SE 18-2s-10w, Patoka Township, was abandoned at 2111 feet when no oil shows were encountered. Lewis, Armstrong and Day's (Ladd Oil Company's) William Blair 1, NE NE SW 8-2s-11w, Patoka Township, was abandoned at 2353 feet, also without a show.

The first dry hole in development of the New Harmony pool of Posey County was registered with abandonment of Superior Oil Company's New Harmony Realty Company, NE SE NW 10-5s-14w, which was dry in the McClosky. This company's No. 4, NW SE 9-5s-14w, was below 1300 feet.

After passing through a slight show of doubtful commercial possibilities in the Tar Springs and Waltersburg sands, Superior Oil Company's George Heil 1, in the Heusler Dome section and in Vanderburgh County, was drilling at 2200 feet.

Kentucky Natural Gas Corporation's P. H. and Kate Axton 1, NW NE NE 30-7s-6w, Ohio Township, Spencer County, had 500,000 cubic feet of gas when the bit penetrated the Waltersburg sand 2 feet. Casing was set. The formation was topped at 882 feet. In this same township, Damron Brothers spudded Mose Stinchfield 1, NW NW NW 30-7s-6w.

Preparations were being made to drill cement plug to Haynes & Thomas Drilling Corporation's Walter and Matilda A. Seifert 1, NW NW SE 19-6s-12w, Marrs Township. Casing had been set to the McClosky, but information on the well's possibilities was not forthcoming.

With an estimated 4,500,000 acres of land under lease for drilling in southwestern and south-central Indiana counties, a definite lessening of leasing activity has been noted, according to Virgil M. Simmons, commissioner of the state department of conservation. Leases on approximately one third of the acreage held has been taken during the past year. Chief operations in the southern part of the state at present are geological and geophysical exploration.

Ohio Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Athens County—		
Gross & Frebault, Ridford 7.....	1	1170
Carpenter & Glazier, Trash 1.....	*	366
Fairfield County—		
City Natural Gas Works, Stimel 1.	¶.20	2164
Jackson County—		
Kelch Bros., Leasure 1.....	¶	584
Licking County—		
Willey et al, Hirst 1	¶.55	2568
Bebout & Sons, Holtz 1.....	¶.79	2646
Shrider et al, Hughes 1	¶.12	2693
Medina County—		
N. Y. Oil Co., Brown 20.....	5	435
Swan & McDevitt, Eaken 20.....	2	369
East Ohio Gas Co., Hange 1.....¶	1.70	2471
Meigs County—		
Ball Run Gas Co., Whaley 1.....	¶.24	865
Monroe County—		
Barnsville Dev. Co., Carpenter 1..	*	1875
H. B. Walker, L. Shriver 1.....	¶.08	2220
Muskingum County—		
D. Y. M. Corp., Bell 8	2	1679
Gas Producing Co., Hess 1.....¶	4.50	4075
Noble County—		
All States O&G Co., Turner 1....	1	815
Clymer et al, Wyskiver 1 .....¶	3.05	1474
Perry County—		
Marshall & Marshall, Donahue 34..	2	1130
Kissling Drilling Co., Wendall 1..	*	925
Washington County—		
Henning Bros. et al, Cullen 1	35	1395

*Failures; †Junked; ¶Million cu. ft. gas.

Another major development of the past few months is a renewal of activity in the old Trenton field of northeastern Indiana, comprising parts of Blackford, Adams, Huntington, Jay and Whitley counties. There is also considerable leasing in the three northern tiers of counties, running from the Illinois line to the Ohio line.

The state department lists 52 producing oil and gas wells completed during the first 6 months of the year, with work in progress at an additional 90 well sites. Of the producing wells, 26 oil and 17 gas were drilled in proven areas and 8 oil wells and 1 gas well were drilled in unproven areas. Dry holes numbered 12 and 35, respectively.

Kentucky Fields

McLean County test starts near Jett sand production

Owensboro, Ky.—Nancy Almon 1, on a 15-acre lease south of Island, McLean County, was spudded last week. It is a joint test 1 mile from nearest production and is being drilled by W. E. Hupp et al, Chester Oil Company, Ashland Refining Company and J. R. Mace et al in the center of acreage held by each firm. South Penn Oil Company has Jett sand production on the Kirtley and Nall leases 1 mile northeast. Almon

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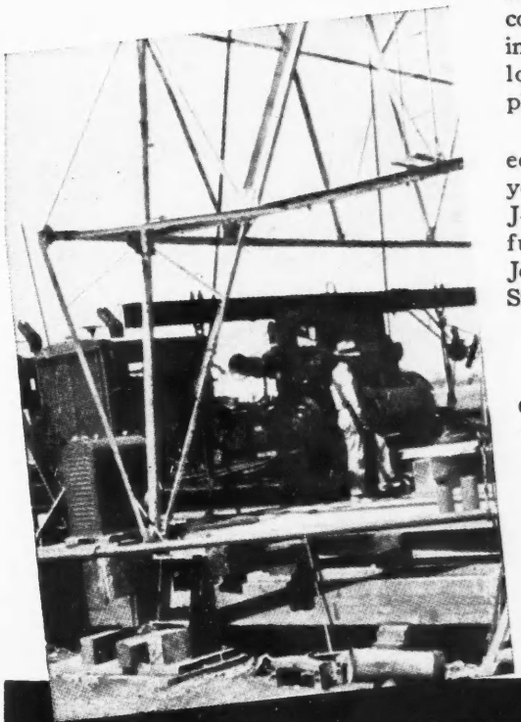
A tryout on your own equipment will convince you of the superiority of J-M 420 Rotary Lining. Get full details by writing Johns-Manville, 22 E. 40th Street, New York, N. Y.



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JOHNS MANVILLE JM PRODUCTS

JOHNS-MANVILLE
420 ROTARY BRAKE LINING

1 will be carried to the McClosky unless commercial production is encountered at a higher level.

P. E. Tichenor's Strother Banks 1, near the mouth of the Green River in Henderson County, was moving in rotary rig to deepen from 1425 feet, to which point the hole was taken with cable tools. Jess Kennard, Evansville, has taken an interest in the test. Cores will be taken in all sands, with the McClosky lime at about 2150 feet as the destination. In the same area, Paul Luhring et al's George Lacke 1 was drilling at about 800 feet with cable tools.

Magnolia Petroleum Company's Sam Green 2, offsetting this company's Sam Green 1 in the Spottsville pool of Henderson County, was spudded last week and at last report was below 1000 feet. It will be carried to the McClosky. Ralston & Sales' Annie Stewart 2, near Spottsville, was drilling below 550 feet. Its successful completion would materially extend this pool, which has seen little development since its discovery a half-year ago.

In northeastern Todd County, Massey, Appell & Whately's Slaughters 1, near Clifty, found the structure running high when it topped the Jett, Jones and Jackson sands. There was no show of oil in any of the sands, but a small amount of water was present in the Jackson. It was deepening from 625 feet with cable tools.

Sun Oil Company was moving in rig to the J. T. Newman 1, in the Gilmore pool of Henderson County, presumably to deepen from the McClosky, where the well had been completed at 2140 feet as a light producer, to the St. Louis.

Kentucky Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Breckenridge County—		
McDonough & Co., Mason 1	*	269
Butler County—		
Cumberland Petroleum Co., Ward 1	10	380
H. A. Henry et al, Willis 6	10	882
Hughes & Powers, Brown 1	*	2090
Daviess County—		
Chenault & Farmer, Nation 3	50	1350
Major Oil Co. & Palmer Dr. Co., Brown 6	400	1400
Can Run Pet. Co., Ambrose 6	*	1176
Hancock County—		
Jack Cox, Waitman 1	30	907
Henderson County—		
Ralston & Sales, Stewart 1	*	2045
Hupp et al, Gregory 1	*	1949
Lee County—		
T. Wittner, Tipton 1	2	....
Muhlenberg County—		
Desmond & Cooper, Ebling 2	*	731
Ohio County—		
O. D. Vickers, Sapp 2	¶	620
White & Vickers, Howard 2	*	640
Neal et al, Mattingly 2	*	....

*Failures; †Junked; ¶Million cu. ft. gas.

West Texas Fields

Permian Basin wildcat at Cedar Lake is promising.

Wasson experiencing expansion in drilling activity.

Midland, Texas.—The Cedar Lake prospect in northeastern Gaines County strengthened its bid to become the next strike in the north portion of the Permian basin by yielding gas at intervals in drilling to 3880 feet. The promising wildcat is Stanolind Oil & Gas Company's Rayner 1, C SW SW PSL Section 3, Block C-30, which is confirming geophysical information by checking high on all markers. The last gas show through heavy rotary mud was from sand at 3640-45 feet. As previously reported, Rayner 1 logged top of Yates at 2700 feet, with an elevation of 2066 feet, then cemented intermediate casing at 2697 feet. High-pressure gas was found between 2710 and 2933 feet, causing several blowouts.

Structural relief afforded by the Cedar Lake test when correlated with a dry hole situated 5 miles west by north and an abandoned pumper about the same distance to the northeast in Dawson County, is more pronounced than other north basin areas. If oil production is developed from the Permian, the producing area is expected to generally extend in a northwest to southeast direction, possibly embracing portions of Dawson and Yoakum counties. Large-diameter hole is being carried in order to continue to the Lower Permian, if desired.

The Wasson field, centering upon the Yoakum-Gaines County line, is registering a steady expansion of drilling activity. Operators have been lax in taking care of direct offsets because of limited pipe-line facilities. Relief on transportation will be provided late in August through completion of Shell Pipe Line Corporation's six-inch outlet. Welding crews began work on the carrier July 22.

The linking of the Wasson and Bennett areas will reach a showdown stage within the next two weeks. Aloco Oil Company's Wilder-Saltmount 1, NWc Section 804, ⅞ mile north extension to the former, was due to reach final casing point last week. Mid-Continent Petroleum Corporation's Comer 1, Section 760, ½ mile south outpost for the Bennett area, was drilling at 4920 feet, having cemented 7-inch at 4848 feet. These two outposts are two miles apart.

Development of sulphur water by Magnolia Petroleum Company's Eaton-Abell 2, northern Pecos County Ordovician wildcat, from Ellenberger at 5160-71 feet, was followed immediately by plugging orders. The Simpson section was absent, as the test passed from Permian to Ellenberger at 5115 feet, with an elevation of 2424 feet. The company is expected to authorize another deep test for its large block of leases before removing the rig for duty elsewhere.

In the Apco pool, site of the only Ordovician production in Pecos County, Magnolia Petroleum Company's Masterson 1 has resumed drilling after cementing 13-inch surface pipe at 592 feet.

The projected Ordovician test in the Shipley pool, Ward County, by Gulf Oil Corporation's Wristen 5, may be deferred indefinitely as result of the development of 1000 feet of oil in 7 hours from pay at 2575-80 feet. Bailing test is under way to determine if the oil yield warrants running pipe to try for a completion. The company was prepared to make a 7500-foot cable-tool test if shallow production was not obtainable in order to retain lease on the Wristen acreage. Old pumping wells are showing signs of early depletion.

Pumping test was scheduled for

West Central Texas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Brown County—		
Plains Prod. Co., Graves 1	*	1365
Western Well Service Corp., Hays 1	*	1361
Callahan County (Wildcat)—		
Warren et al, Williams 1, sec 302	7	595
Eastland County—		
Gamblin et al, Daniels 4	*	656
Hood County (Wildcat)—		
Prince & Miller, Andrews 1	*	830
Lampasas County (Wildcat)—		
Starrett, Tr. et al, Smith 1	*	841
Shackelford County—		
Lee & Key, Lee 4	25	1156
Owens-Snebold Oil Corp., Haterius 4	1250	3191
Smart & Sharrock, Blanton 1	13	522
Blanton 2	21	519
Whittekin et al, Humbler 1, sec 12	*	501

*Failures; †Junked; ¶Million cu. ft. gas.

Texas Panhandle Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Carson County—		
Magnolia, Fee (tract 244) 57	427	3004
Gray County—		
Bradshaw O&G Co., Dave Pope 4	215	3311
Cities Service, Meers 5-C	258	3250
Lone Star, Foster 1	10	2595
Phillips, Merton 5	58	3330
Warner Oil Co., Chapman 7	1441	2674
Hutchinson County—		
McElroy Oil Co., Haile 9	662	3042
Sinclair Prairie, Pritchard 1	¶15.8	3209
Stanolind, Terry 14	189	3014
Travelers Oil Co., Haile 7-B	603	3040
Moore County—		
Canadian River Gas Co., Sneed 2-A	¶41	2455
Shell and Sinclair Prairie, Jones 1	¶41.5	3207

*Failures; †Junked; ¶Million cu. ft. gas.

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Harold Ott et al's Jackson 1, Schleicher County wildcat that has been in process of completion for six weeks from Cisco lime at 4049-81 feet. The well swabbed 30 to 40 barrels of oil daily after using acid.

Emit Ott et al are scheduled to announce location this week for a contracted 6000-foot wildcat to be drilled on a large block, centering upon GH&SA Section 18, Block M, Schleicher County. Owners of short-term leases within the area are cooperating.

West Texas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Andrews County (Fuhrman)—		
Magnolia, L. Jones 1	99	4465
Cochran County (Duggan)—		
Devonian Oil Co. et al, Duggan 4-8-9	554	5038
Crane County (Gulf-McElroy)—		
Gulf, Crier-McElroy 38	435	2946
Crane County (Jordan)—		
Texas Co., University 4-D	1808	3571
Crockett County (Crockett)—		
Lu-Tex Oil Co., University-Gulf 4-17	40	1583
Crockett County (Wildcat)—		
Steel Dust Oil Co., Atwood 1	*	1613
Ector County (Foster)—		
M-B-K Drl. Co. et al, Foster 1-D	1591	4320
Stanolind, Witcher 17	1330	4196
Ector County (Goldsmith)—		
Eastland Oil Co., Cummins 1	517	4205
Phillips-Pure., Cowden 64	769	4140
Ector County (North Cowden)—		
Broderick & Calvert, Holt 7	3148	4412
Llano Oil Co., Holt 3	924	4186
Octagon Oil Co., Woods-Amerada 2	1939	4405
Ector County (Jordan)—		
Parker Drl. Co., McDonald-Texaco 2	400	3690
Gaines County (Wasson)—		
Continental, Wasson 2-50	861	4985
Hockley County (Slaughter)—		
Honolulu Oil Corp., Slaughter 3-77	1258	5000
Howard County—		
Shasta Oil Co., Texas Land & Mtg. Co. 7	1409	2841
Jones County—		
L. H. Choate-S. B. Roberts Co., Williamson 4	40	1898
Condor Pet. Co., Sayles 22	352	1980
Erin Pet. Co., Roberts 1	*	1710
Bert Fields-Carey King, Taylor 5	2200	3268
Gregg Oil Co. et al, Appling 1-B	183	2641
Gwynn & Overby, Adams 1	276	1892
Humble, R. Graves 3	242	2390
Peckham et al, F. A. Pope 1	*	1868
Petroleum Prod. Co., Bryant-Link 2	295	1886
Wichita Prod. Co. et al, Daughtry 1	157	1887
Jones County (Wildcat)—		
Shaheen Oil Co., Minter 1	*	2530
Pecos County (Payton)—		
Pecos State Oil Co., Pecos River 10	171	2083
Pecos County (Pecos Valley)—		
Kone Prod. Co., Pecos Valley 10	34	1651
Pecos County (Shearer)—		
Colvin & Russell, Fromme 1-A	*	1555
Pecos County (Wildcat)—		
R. G. Patillo-Sahara Oil Corp., Gilworth-Gulf 1	*	1910
Magnolia, Eaton-Abell 2	*	5171
Scurry County (Sharon)—		
Teas et al, First Nat l Bank (Snyder) 1	*	2510
W. P. Thompson 2	216	2482
Stoddard et al, McClure 1	139	2492
Ward County—		
Gulf, O'Brien 112	696	2780
E. W. Estes 121	265	2650
Ohio, Johnson 4	101	2056
Sahara Oil Corp., Winter Garden-Humble 6	*	1900
Winkler County (Hendrick)—		
Bates-Reading Oil Corp., Cowden-Texaco 1	297	3010
Winkler County (Keystone)—		
Barnes et al, Crum 4	248	3354
Winkler County (Scarborough)—		
Gulf, Daugherty 71	146	3055
Yoakum County (Wasson)—		
Aloco Oil Co., McGinty-Texaco 1	1314	5195
E. Keller-Texaco 5	712	5157
J. P. Nystel-Texaco 3	861	5150
Devonian Oil Co., Ory 3	1562	5117
Helmerich & Payne-Continental, Dowell 2-A	756	5100
Milhoan Prod. Co., Willard 1	1390	5142
Shell, Baumgart 3-A	1015	5161
Baumgart 6-C	932	5169
Dora Roberts 7	403	5240
Yoakum County (Wildcat)—		
Hudson & Million, Webb 1	*	5502

*Failures; †Junked; ¶Million cu. ft. gas.

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North Texas Fields

K-M-A deep lime pay extended 3½ miles northwest. Bonita discovery exceeds expectations on test.

Wichita Falls.—Wilbarger County is assured of participation in the K-M-A deep lime development as result of an outpost showing for a producer, with a sharp rise noted in the structural position of the Strawn section. This new strike by Consolidated Oil Company's W. T. Waggoner 1-CC, NW SE SE H&TC Section 36, Block 6, provides a 3½-mile northwest extension to the K-M-A field, else is on a separate geological feature previously indicated by geophysical surveys. The hole filled with oil after drilling cement plugs from 7-inch casing at 3985 feet, but production test was delayed because of gas lodging the tools. Production is from saturated lime at 3985-4005 feet and sandy-lime at 4026-65 feet. Nominal oil shows were logged above the K-M-A lime marker at 3763 feet, which is 196 feet higher on structure than the company's Ancell 1, near NW NE SW Section 35, ⅞ mile southwest of the new prospect. Ancell 1 made a small pumper last September after plugging back to the upper Strawn, but has since been abandoned.

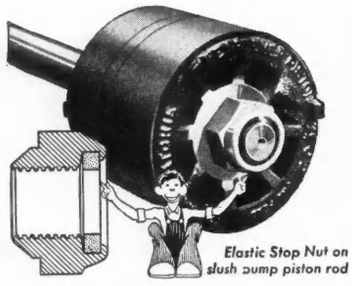
Consolidated Oil Company promptly added to its lease holdings as soon as its prospect indicated a commercial producer. The company purchased S½ NW and S½ SW H&TC Section 2, Block 7, for $125 per acre cash and an additional $250 per acre, payable from ⅛ of the production.

Drilling activity in the K-M-A field has settled to a steady volume of between 50 and 60 operations, with new tests each week about equal to the quota of completions. Currently there are 11 tests drilling with rotary, and 23 wells listed as being in process of completion, else awaiting proration gauge.

Bonita Discovery Exceeds Expectation on Production Test

Proration gauge given Joe Benton and J. W. Holmes' Joe Bowers 2, discovery well in the lower Strawn for the Bonita pool, eastern Montague County, exceeded earlier estimates in flowing 67½ barrels of 40.4-gravity oil through tubing chokes in 3 hours from sand at 3853-69 feet. Casing pressure declined from 945 pounds to 500 pounds at the end of the test, and pressure on tubing was lowered from 250 pounds to 200 pounds. The well is located in northeast corner of lease, Section 55, and 1750 feet north of the partnership's 2900-foot discovery pumper. E. B. Madden et al's Harry Smith 1-a, situated 1½ miles southwest of the Bonita pool, proved dry in fulfilling depth contract at 4526 feet, and is slated to be plugged.

L. T. Burns et al's Pickett 1, prospective ½-mile northwest extension for the Burns-Browning deep pool, western Clay County, developed small show of gas when washed down and swabbed through tubing from saturation in the Strawn at 4430-44 feet. It will be deepened, then shot with nitro. A natural producer was expected, as it is about level on structure with the discovery. Frabor-Hodges Corporation et al's Kinder 1, 4.6 miles west of the above pool, amended orders to abandon after testing dry in Caddo lime at 5445-5527 feet, and cemented casing at 4120 feet after plugging back to 4370 feet. Production test will be made of broken



Elastic Stop Nut on slush pump piston rod

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North Texas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Archer County (Griffin)—		
Deep Oil Dev. Co.-Eph Griffin, Waggoner Est. 3, sec 1	*	4901
Archer County (Ford-Sikes)—		
Sikes et al, Anderson 2, sec 38	93	4445
Archer County (K-M-A)—		
H. A. Schaffer Oil Co., Ferguson 6-A, blk 15	448	3865
Staley et al, Mangold 2-A, blk 29	584	3863
Archer County—		
Carpenter et al, Fee 2, sec 38	*	929
Johnson & Mitchell, Abercrombie 2	2	1331
Baylor County—		
Bowen et al, Portwood 1-B, sec 1279	54	1429
Baylor County (Wildcat)—		
British-American O. P. Co., Green 1-L, sec 8	*	4304
Clay County—		
Cooper et al, Duncan 3, blk 16	14	1227
Martin & Son, Shumake 2, blk 2	*	1166
Cooke County (Walnut Bend)—		
E. B. Cox-Jake Hamon, K. Neu-Texaco 2-B	328	5229
Sinclair Prairie, Best 10 (pb to 5565 ft)	516	5643
Cooke County—		
Beard et al, Voth 2	600	1778
C. & L. Oil Co., Perkins 2	10	943
Kingery Bros. et al, Fisher 3	33	950
McDaniel & Beecherl, J. Weisman 1	*	1034
Peckham et al, S. D. Meador 1	51	1532
Jack County—		
Blue & Rounsville, W. M. Crowley 1	*	485
Danciger, Bailey 2-B	21	2856
Grace et al, M. Hoefle 3	20	430
Jack County (Wildcats)—		
Gilmore et al, L. Carter 1-B, sec 3311	*	387
Leach & Hord, J. P. Hoefle 1	*	475
Montague County (Wildcat)—		
Sinclair Prairie, G. Whaley 1, sec 16	*	5570
Montague County (Bonita)—		
Benton & Holmes, Joe Bowers 2	115	3869
Throckmorton County (Wildcat)—		
Marland-Drake Oil Co., Cobb 1, blk 96	*	3349
Wichita County (K-M-A)—		
Bolin et al, Preston 7, sec 20	552	4011
Browning et al, Ancell 1	30	4002
E. C. Oil Co., Burnside 3	960	4032
Grace & Wood, Birk 1	920	4048
McCutchin et al, Denny 6	216	4003
Shell and Phillips, Preston 7-A, sec 20	1100	4002
Wichita County—		
Bell O&G Co., Powell 40	3	1240
Fisher & Dudley, Warren 6	326	1362
Hanlon & Buchanan, Fassett-Tuttle 2-F	*	865
Madison O&G Co., Burnett-Lloyd 26, sec 7	*	951
Magnolia, Reilly 149	360	1353
McClure et al, Goetze 3	*	440
Goetze 4	3	425
Staniforth et al, Reilly-George-Texaco 4	336	1366
Young County—		
Horwitz & Oldom, Green 12, sec 268	*	734
Johnson et al, Spearman 1	*	585
Pet. Producers Co., Stewart 1	*	920
Trentman et al, Quinn 1-A, sec 1974	571	2760

*Failures; †Junked; ¶Million cu. ft. gas.

sand at 4133-37 feet and 4166-67 feet.

Northeastern Clay County wildcat interest centers upon E. C. Norwood et al's Shipley 1, Block 29, Madison County School Lands, since nominal oil saturation was logged at 4080-85 feet. Dry lime prevailed at 4126-75 feet, and the test was drilling at 4190 feet. Youngblood-Foree et al's Wynn 1, 6 miles west by north of Bellevue, was drilling at 4320 feet.

Sinclair Prairie Oil Company's McGeorge 1, south outpost for the Walnut Bend deep pool, Cooke County, passed up the regular Strawn pay and saturated sand at 5117-29 feet carried salty taste. It will be deepened to the Simpson. The company's Best 12, north offset, swabbed 55 barrels of oil in 17 hours through tubing after plugging back from 5474 feet to 5437 feet to try for a completion in the Simpson, topped at 5269 feet. This lower pay was later treated with 2000 gallons of acid, using 227-barrel oil load. The result of this chemical treatment was not available. Cox & Hamon's K. Neu-Texaco 4-B, formerly 2-B, flowed 41 barrels oil in 3 hours through tubing choke after perforating casing opposite the regular pay. The partnership's K. Neu-Texaco 2-B, originally called 3-B, quit in hard dry lime at 5365-95 feet to cement 5½-inch pipe at 5250 feet for completion.

East Texas salt water return permit sought

The Texas Railroad Commission has under consideration an application of Sinclair Prairie Oil Company for a permit to return salt water to the base of the Woodbine through its No. 9 well on the Amanda Wiley lease, J. Jordan survey, East Texas field.

At a commission hearing, witnesses asserted the thickness of the impervious shale breaks would prevent the vertical rise of the water into any oil formations.

Clark hearing

The Texas Railroad Commission has dated a hearing for August 2 on the application of the Amy Oil Company for a permit to produce its Larison lease in the Clark field, Guadalupe County, under vacuum.

East Texas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Joiner Area—		
P. G. Lake, Inc., Reid 20 (120.1-ac)	600	3595
Stanolind, Maxwell 43-A (108.52-ac)	900	3824
Kilgore Area—		
Apple et al, Johnson 3 (2.89-ac)	2400	3550
Longview Area—		
Allen et al, Bonner 4 (18.9-ac)	750	3596
Humble, Johnson 25 (98.9-ac)	2500	3693
Anderson County (Wildcat)—		
J. C. Cook Drl. Co., Ezell-Copeland 1	*	1020
Henderson County (Flag Lake)—		
Watt & Fred Upchurch, Flag Lake School 1	*	3108
Kaufman County (Wildcat)—		
W. S. McGee et al, Santone Joint Land Co. 1	*	3336
Leon County (Navarro Crossing)—		
Humble, W. Johnson 1 (95.2-ac)	*	5904
Navarro County (Wildcat)—		
Topaz Oil Co., E. Trammel 1	*	3168
Van Zandt County (Wildcat)—		
F. A. Richardson-O. T. Clark, Dodd 1-a	*	4963
Shelby County (Joaquin)—		
McDaniels & Pewitt, McDaniel 1, Snider sur	¶10	6200

*Failures; †Junked; ¶Million cu. ft. gas.

East Texas Fields

Commission position to encourage more drilling

Kilgore, Texas.—The drilling of inside locations in the East Texas field will be stimulated by the railroad commission's announcement that it would liberalize its policy in granting permits for additional wells on a given property. This stand provides an opening for royalty owners to force operators to equalize oil drainage with offset leases by resorting to court action. A substantial number of operators desire to drill more wells, but have held off because of the expense involved heretofore in engaging the necessary legal and engineering talent to plead their cause.

The danger of a large-scale development program re-occurring immediately is lessened by possibility of a drastic change in the method of apportioning production so as to penalize overdrilled leases. The federal court decision awarded the Rowan-Nichols Oil Company last June provides for a new proration order that will discourage excessive drilling, if sustained by the higher courts.

The financing of new wells on densely drilled leases has become more difficult since the release of the court order. Banks have tightened their restrictions on such loans, while drilling contractors are reluctant to drill turn-key wells on such tracts in return for an oil payment.

The East Texas field currently has 11 drilling tests, and new operations scheduled for this week point to a rise in activity. Owners of small drilling sites have been encouraged by the commission's opposition to the federal court decision won by the Rowan-Nichols Oil Company, resulting in more drilling on fractional-acre tracts.

Ten depleted oil wells were listed as plugged the past week, according to commission's records. Prior to the dropping of these abandoned producers the field attained a new peak level of 26,053 wells on the official tabulation.

To drill 4 wells near Panola County strike

Shreveport.—Walter R. Smith and Horace Turner, who recently completed Bird 1, a wildcat in the George Gallaspie Survey, Panola County, Texas, as a 40,000,000 cubic foot gas-distillate well at 4998 feet, will make location soon for the second of a 5-well program planned on this 1260-acre lease. The new location will be north of the discovery and on Panola Development Company land. Following completion of the 5-well program these operators plan a recycling plant of 50,000,000 cubic feet daily capacity, and a pipe line from the wells to Carthage where the distillate will be loaded on tank cars.

Distillate from Bird 1 is water white. Tests indicated 1000 gallons per 1,000,000 cubic feet. The second well will take in more of the producing formation than the first well with the hope of getting an oil stratum under the gas-distillate zone.

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Southwest Texas Fields

Robstown wildcat makes gas; will perforate lower. New deep sand discovered in western part of Saxet.

Corpus Christi.—Development of gas on the first production test has delayed opening the Robstown area in Nueces County. Shield Oil Company was to drill plugs and reperforate J. T. Potter 1, NW Block 10, Paul's subdivision, late in the week. On a drill-stem test through perforations 5565-72 feet, the well flowed a large volume of gas with pertoleum odor under 1200 pounds pressure in 10 minutes. The new holes will be made about 10 feet lower.

This test, drilled on a geophysical prospect, was carried to 7089 feet, then plugged back for tests of a sand section at 5548-82 feet. Since its beginning, the well has been closely watched as a possible discovery of a new field. Leasing was carried on at a rapid pace with high prices being made for tracts in the general trend.

Tries to Blow Out

Saxet, largest field along the Nueces County trend, apparently has another deep oil sand. Hiawatha Oil & Gas Company's F. J. Smith 1, Block 35, Sheppard Farm Lots, was deepened to 9880 feet, where it tried to blow out. The hole was killed and preparations made to core the sand zone topped at 9862 feet. While coming out of the hole, pipe stuck at 8400 feet and the well again tried to get away, making some oil and gas through the heavy mud. It was killed again and efforts were being made to pull pipe as the week closed. The well previously had been completed at 6937 feet.

The new discovery is in the western portion of the Saxet field and paves the way to more deep drilling in this area. At Clarkwood, in the south end of the field, one test went to 9937 feet and flowed a large volume of distillate.

Minnie Bock, new field in Nueces County, received several failures. Reed & Cox's Ruegg 1, west side of the area, was a failure at 6003 feet. Texas Conservative Oil Company's Humble 1, on the north side of the field, quit at the 6000-foot contract.

Phillips Petroleum Company may be extending LaRosa field of Refugio County, ½ mile northeast. Toland 1, Section 39, went to 7028 feet, plugged back and is testing in the 6300-foot zone.

New LaGloria Sand

Magnolia Petroleum Company is considered certain to open a new oil sand in LaGloria, Jim Wells County, with D. O. Maun 1, a mile west of production. It tested oil and salt water through perforations 6809-15 feet, plugged back, and was testing again through perforations slightly higher in the same zone.

Ben Bolt field, same county, received a setback with H. J. Mosser et al missing the 5200-foot sand in Perales 1, Block 2, Whitman subdivision. It continued drilling below 5305 feet.

Hunter & Quinn's Pundt 1, on the Wade City structure of Jim Wells County, was ready to squeeze perforations for a test about 10 feet lower in the basal Frio sand. The well made about 75 barrels of distillate with a large volume of gas from perforations at 4803-8 feet. The bottom of the sand is figured at 4820 feet, leaving 12 feet of zone yet to be tested.

Jackson County has a possible new field discovery in Moore, Ahern and Cron & Gracey's S. G. Drushel 1, P. Scott Survey, 4½ miles northeast of Lolita. The hole had been carried to 7008 feet, plugged back to about 5900 feet and was to test above that level in the Frio sand.

West of the new Vanderbilt-West Ranch play, Mayo, Cullen et al's Tucker 1, was below 6525 feet, drilling to an 8000-foot contract. It has had a number of showings of oil and gas in the Frio zone.

Live Oak County may have new Jackson sand field

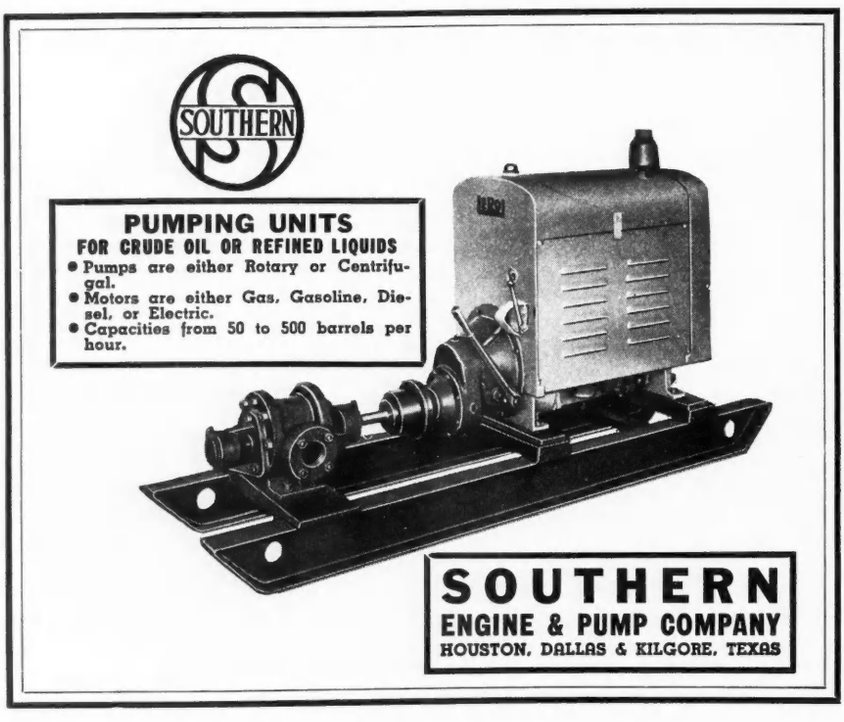
Beeville.—A new upper Jackson sand oil field was in prospect for Live Oak County late this week. On a Shell Oil Company farmout, Sal Viejo Oil Corporation encountered an oil sand at 2135-48 feet, showing 260 feet of oil and mud on a 20-minute drill stem test. The well is bottomed at 2152 feet, four feet in shale. Casing may be set for completion.

The well is Rizer 1, located just northeast of NEc Survey 192, but in Survey 382, about 15 miles southwest of George West.

South Texas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
SAN ANTONIO DISTRICT		
Atascosa County—		
Pulliam & Dickson, Henke 1 (WC), A. Donavan sur	*	1202
Caldwell County—		
Steck, Wilson 9 (Salt Flats)	19	2690
Tinkle, New 1 (Salt Flats)	25	2695
Comal County—		
North Sweden, Gruene 1 (WC), Henry Foster sur 34	*	2350
Edwards County—		
Reynold, Turney 1 (WC), sec 164	1	415
Guadalupe County—		
Chiquita, Tadlock 5 (Darst Creek)	61	2639
Garrett, Tadlock 3 (Darst Creek)	46	2642
Tide Water, Jackson 1 (WC), sur 422	*	2710
Medina County—		
Medina Production Co., Schmidt 7-A (Ina)	10	948
Milam County—		
Edward, Camp 3 (WC), D. Robinson sur	*	1930
Travis County—		
Matthew, Ballerstadt 1 (WC), sur 52	*	952
Strief, McEachew 1 (WC), O. Buckman sur	*	790
Val Verde County—		
Prince & Powell, Harrison 1 (WC), sec 20	3	425
Williamson County—		
J. Monk, Zieschang 1 (Byersville)	*	910
LAREDO DISTRICT		
Duval County—		
Argo, Fee-Rodden 6-A (Hoffman)	120	2573
Corkill, Tonkin 1 (WC), Piedras Pintas	*	5902
Magnolia, DCRC 14 (189) (Cedro Hill)	35	1436
31 (201) (Eagle Hill)	350	2094
Miller, Miller 8 (Longhorn)	200	5635
McMullen County—		
Jones, Ezzell 95 (WC), P. Faddin sur	*	1628
Schumway & Burns, Shiner 5 (WC), blk 1	*	1535
Starr County—		
Clopton & Mitchell, Wardner 1 (S. Rickaby)	45	1744
Webb County—		
Boysen & Jones, Watkins 2 (WC), sec 20	*	1406
Magnolia, Benavides 7-B (Volpe)	54	2478
Zapata County—		
Buffalo, Union-Hinnant 1 (Mirando Valley)	*	2260

*Failures; †Junked; ¶Million cu. ft. gas.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Series of failures slows drilling boom in Volpe

Laredo.—A series of failures brought to a standstill a prospective drilling boom in the new Volpe field of Webb County. The area at first looked like one of the important Mirando sand discoveries of this trend.

Magnolia Petroleum Company's Volpe and Benavides 8, one location west of production, found sand with oil odor at 2715-35 feet and salt water sand at 3086-92 feet, but is going ahead near 3300 feet. J. M. Anderson's Benavides 3, a mile south of the production, is coring below 2535 feet, having found salt water in the discovery pay. V. G. Schimmel's Benavides 2, 3 miles southwest of the field, is an abandonment at 3031 feet.

Longhorn field, Duval County, has been further expanded to the southwest in both the 4000- and 4900-foot pays. Several wells are drilling along this trend, each offsetting the preceding operation. On drill-stem tests, they flow in from 25 to 30 minutes and develop excellent pressures.

Wildcat near LaReforma shows gas and distillate

McAllen.—Magnolia Petroleum Company has proved a major extension to LaReforma field or has opened a new producing area in Starr County with

CORPUS CHRISTI DISTRICT

Company, Well and Location	Init. Prod. Bbls.	Depth
Aransas County—		
Wilson, Brown 1 (McCampbell)...	500	7208
Brooks County—		
Magnolia, Denman 2 (WC), 1 mi n line of county	*	6878
Calhoun County—		
Buchanan & Blanco, Morris & Dunwoody 12 (Heyser)	175	5487
Cameron County—		
Wedegartner, Sams-Porter 2 (WC), 3½ mi se San Benito.....	*	1160
Hidalgo County—		
Phillips, Flores 2 (Samfordyce)..	¶4	4051
Shary-Maddox, Neal (WC), blk 2..	*	7506
Jackson County—		
British, Alee & Hale 1 (WC), Francitas area	*	8809
Jim Wells County—		
Atlantic, Bankers Mortgage 1-C, (East Alice)	500	5380
Howety & Lewis, Adams 2 (West Alfred)	450	4690
Morgan's Fee 1-F (Reynolds)	550	5173
Ramsey, Gomez 1 (East Alice)....	500	5374
Live Oak County—		
Seacord & Shure, Bonham & Marsden 1 (White Creek)	*	1435
Bonham & Marsden 2.....	*	1470
Nueces County—		
Buchanan & Blanco, Gandy 1-B (WC), sec 60	150	6903
SEW, Dallas Bank 1 (WC), sec 148	*	6585
Seaboard, Luby 44 (Luby)	350	4358
Shary & Coastal, Shary 2 (Clara Driscoll)	*	5685
Sinclair Prairie, Isensee 7 (Saxet)	600	4895
Southern Minerals, King 3-B (Richard King)	750	5407
5-B (Richard King)	500	5388
Stanolind, Spessard 26 (Luby) ...	400	5066
Texas, Humble 1 (WC), North Clara Driscoll area	*	6005
Western, Prious A-1 (Saxet)	450	5784
Refugio County —		
Coronado, Rooke 16 (La Rosa) ..	500	5905
21 (La Rosa)	500	5905
Quintana, Heard 9 (Tomoconnor)	500	5925
Tom O'Connor 9-B (Tomoconnor)	500	5862
Union's Fox 23 (Fox).....	*	6573
San Patricio County—		
Grote & Corgey, Sikes 1 (McCampbell)	650	7150
Humble, Countiss 3 (East White Point)	500	5675
Plymouth, Solar & Ficke 7 (East White Point)	650	5654
Womack 1 (East White Point)..	650	5676
Rantex, Heuermann-Frank 1 (McCampbell) 1000		7175
Sun, Kirk 2 (East White Point)..	600	5638
Victoria County—		
Barnsdall, Keeran 4 (Keeran)	350	5607
Schovajsa 1-C (Placedo), ow dd.	450	6080
Oliver & Renwar, Johnston 1 (WC), E. Perez sur	*	6018

*Failures; †Junked; ¶Million cu. ft. gas.

Condensed Statement of Condition of the

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At the Close of Business Wednesday, June 30, 1939

RESOURCES

Cash		$13,382,837.78
U. S. Government Obligations (all carried at par or less)		20,474,581.25
Investment Bonds and Municipal Obligations (all carried at par or less)		1,769,588.00
Stock in Federal Reserve Bank		64,650.00
Loans and Discounts		4,354,551.45
Interest Earned but not Collected		74,449.35
Building Account		967,312.15
Other Real Estate Owned		1.00
TOTAL		$41,087,970.98

LIABILITIES

Capital Stock		$ 1,200,000.00
Surplus		955,000.00
Undivided Profits—Net		340,975.37
Reserved for Taxes, Interest, etc.		127,731.78
Interest and Discount Collected but not Earned		18,315.20
Reserved for Undeclared Dividends		48,000.00
Deposits: Commercial	$20,727,540.09	
Correspondent Banks	5,409,143.20	
Time	9,058,350.87	
Public Funds	2,963,580.82	
Other Deposits, Certified and Cashier's Checks, etc.	239,333.65	38,397,948.63
TOTAL		$41,087,970.98

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Guerra-Fee 2. The well encountered a sand, apparently in the Vicksburg zone, at 5800 feet and made a series of tests through the section, all of which showed gas and distillate. The well is near the southwest corner of the Santa Cruz grant and is about 3½ miles southwest of LaReforma production.

On a drill-stem test 5800-7 feet, the well recovered 15 feet of mud cut with distillate under 1050 pounds pressure in 15 minutes. A second test at 5807-16 feet developed 31 feet of fluid, 16 feet distillate and 1000 pounds pressure through ¼-inch chokes in 14 minutes. A test at 5816-28 feet recovered 45 feet of fluid, 5 feet of distillate and 950 pounds pressure through ¼-inch chokes in 15 minutes. Guerra-Fee 2 continued drilling below 6010 feet.

Texas Gulf Coast

"No dope" Chocolate Bayou wildcat holds interest.

Turnbull running screen for test at Cedar Bayou.

Houston.—McCarthy Drilling Company's Houston Farms Development Company 1, in the Chocolate Bayou area, Perry & Austin Survey, Brazoria County, continues to hold the interest in this area, due to unconfirmed rumors of 25 feet of oil sand around 8900 feet. Last week the wildcat was bottomed at 10,200 feet and side-wall cores were being taken. An electrical log previously had been run. McCarthy is withholding information on the test. Mrs. Mellie Esperson, Houston, is reported to have purchased 1160 acres in the area of the wildcat.

In the Cedar Bayou area of Chambers County, where several tests have shown oil, J. R. Turnbull is running screen and liner for a production test in Sheppard 1, R. A. Peter Survey. The hole is bottomed at 6466 feet; 7-inch casing sets at 6429 feet. Turnbull attempted a drill-stem test at 6408 to 6466 feet but the seat of tool failed to hold. The best sand cored in the wildcat was from 6459 to 6461 feet.

Another wildcat in the Ogburn area, Harris County, has logged the thin broken oil and gas sands, which are usually cored in this area but which have never been productive. Coastal Development Company's Sweeny 1, J. C. Ogburn Survey, down to 7500 feet at the close of the week, was running an electrical log. Sand and shale with an odor of oil with a salty taste were cored at 6826 to 6857 feet; broken sand with odors of oil and gas were logged from 7067 to 7073 feet; odors of distillate with a salty taste were found in cores at 7074 to 7085 feet.

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Texas Gulf Coast Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Brazoria County—		
Rowan Drilling Co., Vilven 1, Iowa Colony area, H. & T. C. sur.	*	6500
Clam Lake—		
Shell, McFaddin-State 4	*	4000
Danbury—		
Fox-Wood, Blakley 1 (wo)	*	2755
Publix Pet. Co., Blakley 2	*	2770
Rowan Dr. Co., Jamison 5 (wo)	¶¼	3091
Dickinson—		
Bennett Oil Corp., Gray 4	488	9034
Coast Pet. Corp., M. Stewart 15	667	8707
Fort Bend County—		
Jack Frazier-S. Martin's Blakley 1, Clodine area, Fredrick sur.	*	8308
Friendswood—		
Humble, Keller 2	600	6046
Kiesling & Dixon 14	595	6074
Humble-West Fee B-31	568	6046
Hardin—		
Atlantic, McMurtry C-1	312	7626
Humble, Partlow B-4	262	7600
Texas Co., Humphreys 3	244	7645
Hitchcock—		
Maco Stewart, Fee 13	473	5140
Hull—		
Guinn Oil Co., Abel 16	15	569
Humble—		
M. C. Harris, Jordon-Gulley 3	12	595
Louise—		
Gulf Stream, Kountz 12	219	5154
Kountz 13-A	285	5160
Magnet—		
McDannald Oil Co., Coffee 1	57	5546
Markham—		
Hamil & Hamil, Myers 6-B	268	3585
Old Ocean—		
Harrison & Abercrombie, Osburn 2	300	10,334
Mid-Continent, Chenault 1	316	10,065
Port Neches—		
Texas Co., Kuhn 15	118	5914
Seabreeze—		
Sun, Hoffman 2	108	8490
South Houston—		
Stanolind, Drilling District 27-1	362	6775
Withers—		
Texas Co., Pierce Estate B-32	172	5547

*Failures; †Junked; ¶Million cu. ft. gas.

Commerce Oil Company's Staiti 1, outpost at South Houston field, Harris County, was reported to be running 7-inch casing to core deeper at 7554 feet at the end of the week. This well blew out some time ago when a sand was topped at 7528 feet and drill pipe was stuck. The hole has been cleaned out to bottom to resume operations.

East of production at Cedar Point, Chambers County, Salt Dome Oil Corporation and Standard Oil Company of Texas' State 13-117 was down to 8500 feet in the Vicksburg formation and running an electrical log at the close of the week. This is the deepest well ever drilled at Cedar Point. Sand with an odor of oil was logged at 8200 to 8210 feet.

Sun Oil Company's Cavalin 1, west of Palacios, Matagorda County, which has indicated several times it would open a new field, went to salt water last week. The hole was perforated at 7860 feet and the last gauge was 34 barrels of fluid daily with a tubing pressure of 600 pounds and casing pressure was 800 pounds. It then went to salt water through a 11/64-inch choke. Tubing pressure was 650 pounds and casing pressure was 875 pounds.

To Test Shows

Geo. Echols, Hebert and Smith's second well at South China, Fontenot 2, Jefferson County, is preparing to run casing for a production test; cores taken at 7873 to 7881 feet showed oil sands; those at 7889 to 7899 feet were gas sand; 7899 to 7908 feet, shale; and from 7927 to 7939 feet, salt water sand.

Mid-Continent Oil Corporation has completed its first deep oil producer at Old Ocean field, Brazoria County. Chenault 1, C. Breen Survey, northwest side of the field, was drilled to 10,491 feet and plugged back, and perforated from 9,940 to 10,065 feet. It flowed 316 barrels of 57-gravity oil daily through ¼-inch choke with a tubing pressure of 1900 pounds. Casing was sealed.

In the Clodine area, Ft. Bend County, Jack Frazier and O. S. Martin's Blakley 1, J. Fredrick Survey, was abandoned last week at 8308 feet in shale. A test at 7920 feet showed mud; salt water sands were cored in the Cockfield formation.

Wildcat Salty

Another failure was reported for the Iowa Colony prospect in Brazoria County last week when Rowan Drilling Company abandoned Vivian 1, south of Normandie Oil Company's Ramsey 1, at 6515 feet after coring salt water sands. The first salt water sand in the Frio was logged at 6026 feet; at 6414 feet another was encountered.

Northeast of production at Fairbanks, Harris County, Kirby Petroleum Company was testing Hillebrenner 1. Casing was perforated with 21 shots at 6842 to 6846 feet and the well was flowing an estimated 74 barrels daily. Union Producing Company's Daniel well in the same area was shut in after flowing gas from perforations at 6790 to 6810 feet. Tubing pressure was 2225 pounds and casing pressure was 2450 pounds.

C. B. Bunte's Cartwright 1 in the Magnolia Springs area, Jasper County, continues to core salt water sands. Last week additional sands were found at 6971 to 6984 feet. The hole is down to 7115 feet in shale.

Ohio Oil Company's Carlson 2 at North Markham field, Matagorda County, looked disappointing last week when a thin section of sand with odors of oil was cored. The hole is bottomed at 8003 feet in salt water sands. Several salt water sands were cored.

Acreage-potential proration proposed at Cordele

Proposed field rules for the Cordele pool in Jackson County, submitted to the Railroad Commission at a special hearing last week, call for ten-acre spacing with proration based to 75 percent on acreage and 25 percent on the well. Wells would be spaced 660 feet apart and 330 feet from lease lines, with a tolerance of ten acres.

H. J. Porter, owner of most of the acreage in the pool, presented the field rules which were agreed to by big operators, who said they would, however, prefer 20-acre spacing.

The rules called for 400 feet of surface casing minimum, and an oil string cemented at least 750 feet above the shoe. Potentials would be taken through quarter inch chokes six inches long; the 2000/1 gas-oil ratio rule would be used.

Geologist Robert Franks said there are 33 wells in the field producing from three sands within a section of 150 feet. The production comes from the Oakville at around 2700 feet.

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South Louisiana

Vermilion Bay wildcat produces oil from Miocene. Eola outpost runs low; several new sands revealed.

Lake Charles.—Vermilion Bay, which has had a number of deep tests drilled around its flanks, was converted into an oil field last week when The Texas Company completed Vermilion Bay 3-B in Miocene sands at 10,241 feet. The wildcat topped broken shows of oil around 10,131 feet. After setting casing and 24½ feet of screen it came in flowing 300 barrels of 31.9-gravity oil daily through a 10/64-inch choke with a tubing pressure of 1400 pounds. The gas/oil ratio was 600 to 1.

Vermilion Bay was discovered by reflection seismograph by Louisiana Land & Exploration Company in 1927. It has long been known as a salt dome; salt first was encountered around 796 feet. On June 6, 1938, the company's Vermilion Bay 2-B blew out at 9667 feet and later abandoned. The Texas Company's Vermilion Bay B-1, drilled to 10,622 feet in February, 1937, is the deepest hole ever drilled on this prospect.

The northern limit of Eola field, Avoyelles Parish, evidently has been found by Amerada Petroleum Corporation's Stokes 1, which was down to 8616 feet last week after topping the Wilcox formation at 8566 feet. A few thin streaks of sand with a showing of oil were logged from 8599 to 8609 feet in the well, which was considerably lower on structure than wells in the main part of the field. Southwest of production in the same field, Amerada Petroleum Corporation's Haas 1 was down to 8700 feet and was running an electrical log to 8696 feet. No shows of oil have been reported in this test, which is below the producing level for the field.

J. Edward Jones is preparing to spud Sam Barone 1, northeast of production at Eola. It is reported that the semi-wildcat is located on a geophysical high. East of the field, Gulf States Exploration Company made another production test on Haas 1 and it showed salt water. The well was plugged back from 8577 feet and sidetracked at 6450 feet. It was redrilled down to 8571 feet and casing was perforated with 72 shots at 8564 to 8580 feet. It came in flowing 168 barrels of oil, three percent basic sediment and water, daily through a ¼-inch choke with a tubing pressure of 450 pounds. Later it went to 100 percent salt water and died. The company will make another test.

Continental Oil Company's Derouen 2 has proven that the Wilcox sand at Villa Platte, Evangeline Parish, will cover a large area. Some are predicting that it will cover a larger area than the present limits of the Sparta production. Derouen 2, on the northeast side of the field, logged the Wilcox sand at 9940 feet, and is slated for a production test. The hole was drilled to 10,390 feet, plugged back, and set 6-inch casing at 10,277 feet. It had the Sparta sand at 8986 to 9010 feet. Derouen 2, the fourth well to log the Wilcox at Villa Platte, is about normal structurally with the southeast flank well which was completed at 10,085 feet as a good Wilcox producer and is lower than Tate 1, the highest well in the field, which was plugged back from the Wilcox and completed in Sparta. Vidrine 1, southwest flank well, is the lowest well in the field on the Wilcox. Derouen 2 had a good Wilcox section and is reported to have shown as much saturation as the other wells that penetrated the formation.

In the Unknown Pass area of unproductive Orleans Parish, T. T. Burton's L & N RR 1, wildcat, was down to 10,294 feet at the close of the week and was setting a short string of 5-inch liner to make a production test around 10,134 feet.

A new shallow sand was discovered at West Gueydan field, Vermilion Parish, last week when Magnolia Petroleum Company brought in Ferguson 2, as the best oil producer in the field. The well was perforated at 6685 to 6695 feet and it came in flowing 801 barrels of 38.6-gravity oil daily through a ¼-inch choke, with a tubing pressure of 1150 pounds and a casing pressure of 1000 pounds. The field has been producing from 7150 feet. The operators have staked location for Ferguson 3.

In the White Lake area, Vermilion Parish, Louisiana Land & Exploration

South Louisiana Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Cameron Meadows—		
Burton-Sutton, School Land 26....	*	8065
Charenton—		
Pan American, Robichaux 7	5	1051
Convent—		
Continental, Realty Operators 2...	204	8045
Darrow—		
Humble, Community 22	*	5831
Eola—		
Feazel, Keller 1	675	8560
Pomo Pet. Co., Sentell 2	780	8573
Golden Meadows—		
Benett, Collins 1 .....¶1½		5173
Iowa—		
Shell, Wait 1	*	8248
Jennings—		
Carter, Perrin and Brian, Arpent 2	75	1798
Superior, Moresi 4	500	7098
Sorrento—		
Pan American Prod. Co., United Lands 17	245	903
Valentine—		
Pan American, Harange 20	*	6747
Villa Platte—		
Continental, Attalles 1	135	9110
Hirsh 3	198	9072
Vinton—		
N. D. Mayfield, Lyons 1 (wo)	*	4490
West Gueydan—		
Magnolia, Ferguson 2	801	6695
Avoyelles Parish—		
Adams Oil & Gas Co. et al, Poor Farm 1, Marksville area, 8-2n-4e	*	6601
Beauregard Parish—		
Atlantic, Rice 1, Merryville prospect 22-3s-11w	*	8516
Iberia Parish—		
Texas Co., State 3-B, Vermilion Bay, Vermilion Bay prospect...	300	10,241
Vermilion Parish—		
Louisiana Land & Exploration Co., Louisiana Furs 1, White Lake area	*	11,033

*Failures; †Junked; ¶Million cu. ft. gas.

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Company's Louisiana Furs 1, Section 21-15s-1e, was abandoned last week at 11,033 feet in shale. A sand with a gas show was cored at 10,199 to 10,209 feet.

Stanolind Oil & Gas Company is swabbing to test a new shallow sand at Welsh field, Jefferson Davis Parish, in Irwin-Bishop 3-B, which topped the dome's first salt last week at 6315 feet and drilled that formation to 6458 feet. It was plugged back and 5½-inch casing, set at 3860 feet, was perforated with 10 shots at 3799 to 3801 feet.

Deep Zone at Woodlawn

Union Sulphur Company is testing Calcasieu National Bank 5 at Woodlawn field, Jefferson Davis Parish, in a new deep horizon. After setting 7-inch casing at 9801 feet the hole was drilled out to 9685 feet and casing was perforated with 30 shots at 9675 to 9683 feet. The well was washed and it came in flowing 152 barrels of oil, 63 percent salt water, through a 14/64-inch bottom-hole choke. Tubing pressure was 200 pounds. The oil tested 35.1 degrees. Testing continues.

East of production at Chalkley, Cameron Parish, Shell Oil Company is preparing to complete its first oil well for the field. Hanszen 2 cored oil sands at 8773 to 8809 feet; 8844 to 8876 feet; 9070 to 9106 feet and from 9235 to 9255 feet. The hole is bottomed at 9311 feet and 5-inch casing has been set at 9296 feet. Chalkley was discovered by Humble Oil & Refining Company, at present the only producer in the field. Shell Oil Company's first well, Hanszen 1, was abandoned. Chalkley is producing from 8450 feet, 8560 feet, 8660 feet and 8950 feet.

Atlantic Refining Company logged a new shallow sand at North Tepetate field last week in Klumpp 5, Acadia Parish, a test that is down to 8900 feet with 7-inch casing set. Broken sands with oil show were cored at 7695 to 7720 feet. The well will probably be tested up the hole at other horizons, and if it is not productive in those horizons it probably will be plugged back to 7730 feet to make test at 7720 feet.

Marksville prospect, Avoyelles Parish, looked disappointing last week when Adams Oil & Gas Company-Lisbon-Iberia Oil Company's Poor Farms 1, Section 8-2n-4e, failed to find production in Sparta or Wilcox formation and was abandoned at 6601 feet. The wildcat logged a sand with a slight odor of oil at 5630 feet, but it did not warrant a test. Top of the Wilcox formation was logged at 5632 feet.

Atlantic Refining Company's Rice Land 1 on the Merryville prospect, Beauregard Parish, which indicated it would open a new producing area for this district, was abandoned last week at 8516 feet. A drill-stem test at 7600 feet showed salt water. The hole was then shot with nitroglycerine and another drill-stem test showed 4500 feet of salt water. The operators also made tests at 8282 feet, 8140 feet, 8108 feet, 7950 feet, 7720 feet and 7586 feet, all of which showed salt water.

Skelly Oil Company may open a new producing sand for Starks field, Calcasieu Parish, with its first tests in the field. Industrial Lumber Company 1, drilled to 5350 feet, logged 11 feet of oil sand at 5237 to 5248 feet. Frio was topped at 4790 feet. The well is shut down for orders.

North Louisiana Fields

Commercial well in lower Marine at Lake Bisteneau. Mile outpost at Sligo makes gas and salt water.

Shreveport.—Although of small capacity, gauging only 3,200,000 cubic feet of wet gas daily with a spray of distillate, the first commercial well from the lower Marine in the Lake Bisteneau field, Bienville Parish, was completed last week in Arkansas Fuel Oil Company's Gayoso 2, C SW SE 14-16n-10w, at 8532 feet. The field has six gas/distillate wells in the basal Glen Rose.

With an elevation of 188 feet this test topped Nacatoch at 983 feet, logged massive anhydrite from 3898 to 4135 feet, topped Travis Peak at 5432 feet, and topped the lower Marine at 7850 feet.

The eighteenth lower Marine oil well for the Cotton Valley field, Webster Parish, was completed July 27 in Hunt Oil Company's Hope 30, NW SE 30-21n-9w, a location east of former lower Marine oil production in the southeast part of the field. The well was completed at 8713 feet and late in the week was still flowing into tanks without gauge. It is producing from the "E" or Bodcaw sand of the lower Marine. Oil has been found on the northwest, south and southeast flanks of this dome in the "D" and "E" sands of the lower Marine, which on top of the structure produces gas/distillate.

One mile southeast of Sligo production in Bossier Parish, H. M. Harrell and associates' Thompson 1, Section 20-17n-11w, waited orders July 27 after showing salt water with gas on a production test. A squeeze job will be attempted. Casing was perforated in basal Glen Rose lime from 5045-70 feet and from 5155-65 feet and about 10 million feet of gas appeared with the water. Previously the well had shown an estimated 30 million cubic feet of gas daily on a drill stem test in the basal Glen Rose lime in a sand below the

North Louisiana Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Bienville Parish (Bisteneau)—		
Ark. Fuel Oil Co., Gayoso 2, 14-16n-10w	¶3	8532
Caddo Parish (Shreveport)—		
Red Iron Drlg. Co., Agurs 1, 25-18n-14w	600	5572
Sabine Parish (Converse)—		
Oklahoma-Texas Co., Frost 1, 22-9n-13w	360	1880
Webster Parish (Cotton Valley)—		
George Barham, Hodges-Ohio 1, 23-21n-10w	320	5839

*Failures; †Junked; ¶Million cu. ft. gas.

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Magnolia—Houston

Pettet, regular basal Glen Rose producing horizon at Sligo, but the production test was in the Pettet. Total depth is 5683 feet in Travis Peak.

The Shreveport field's forty-third Pettet (lower Glen Rose) oil well was completed last week at Red Iron Drilling Company's Agurs 1, located 1900 feet south and 717 feet east NWc 25-18n-14w, completed at 5572 feet, flowing 30 barrels per hour with 5 percent salt water.

In DeSoto Parish where H. H. Hay has recently assembled two blocks, one in township 13 north, range 15 west and in township 14 north, range 14 west, is adding to his holdings in the same parish in township 15 north, range 14 west. In LaSalle Parish, south of Olla, Tom Moore of Dallas has taken approximately 5000 acres in township 10 north, ranges 2 and 3 east. In Jackson Parish, A. J. Harper and associates have leased 10,000 acres around Section 12-17n-2w, and in Sabine Parish in township 9 north, range 11 west, W. E. Mannan has assembled a block for a 3500-foot test. In the southern part of the same parish, George Ellis, who drilled a test in Section 8-5n-12w that showed oil at 2350 feet, is adding 2000 acres to his original block of about the same size, for a 3000-foot or deeper test to start in three months.

In Webster Parish, Seaboard Oil Corporation has assigned several hundred acres of a block it owns north of Cotton Valley, to Hunt Oil Company, the leases being in the northern sections of township 21 north, range 10 west and the southern part of township 22 north, range 10 west.

Bids were received again last week by the city of Shreveport on its 80-acre municipal golf course that is adjacent to production in the Shreveport oil field. Three bids were submitted, being taken under consideration. C. H. Lyons offered $5000 cash and one eighth royalty, agreeing to drill one well on the west 40 acres immediately and on the second 40 acres in 60 days after the first is completed, with a 1/32 over-riding royalty. W. C. Feazell, who once had the lease and turned it back to the city, offered 3/16 royalty with a drilling obligation for two wells. Henry Fotiades offered $50 per acre and one eighth royalty for the first well and an over-riding royalty of one sixteenth for the second well.

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Arkansas Fields

Lewisville-Stamps field may have mile extension

El Dorado, Ark.—The fifth Glen Rose oil well was completed last week in the Lewisville-Stamps field, LaFayette County, Arkansas, and another operation 1 mile northeast of production gave promise of being a producer as it swabbed oil but refused to flow. All of the wells in this field have been of small capacity.

The field's fifth well is East Texas Refining Company's and Erwin & Leach's Cleve Warren Estate B-1, C N½ NE NW 24-16-24, which on initial gauge made 67 barrels of oil daily from total depth of 3505 feet; the mile northeast outpost showing for a producer is the same operators' Bodcaw 1, NW NW 19-16-23, testing at total depth of 3480 feet.

Anticipated extensions east and west in the Magnolia field, Columbia County, materialized last week. On the west side of the field, Oliphant Oil Company's Joel Jones 1, NE NE 20-17-20, on July 27 was completed flowing 383 barrels of oil the first 15 hours through 11/64-inch choke from 7550 feet. East of production, Atlantic Refining Company's Spain 1, NW NW 18-17-19, was completed at 7619 feet, flowing 29 barrels of oil per hour. Five new locations were announced in this field last week.

Cato Oil Company's R. R. Harrell 1, C SE SE SW 35-4n-12w, Faulkner County wildcat, was shut down waiting for casing at 2370 feet after showing 30,000 to 50,000 cuibc feet of gas daily in a sand topped at 2365 feet.

Lion Oil Refining Company's Tissue 1, Section 15-18-19, expected to be the third well at Atlanta, was waiting on cement to set at 8310 feet.

Arkansas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Columbia County (Magnolia)—		
Atlantic, Spain 1, 18-17-19	696	7516
Columbia County (Village)—		
Standard, A. Lewis Unit 1, 15-17-19	240	7430
La Fayette County (Stamps-Lewisville)—		
East Texas Ref. Co. et al, Warren Est. B-1, 24-16-24	67	3505
Union County (Schuler)—		
Lion, Bessie 1, 7-18-17	240	7715

*Failures; †Junked; ¶Million cu. ft. gas.

New Mexico Fields

Lea County drilling takes upward spurt

Hobbs, N. M.—Four new operations assigned the Lovington pool the past week enabled this new oil area to set the pace for Lea County, and each of the new projects may require from 1 to 3 offsets. Lea County was credited with 10 locations, as compared to 6 the previous week.

Southeast extension for the Lovington area is sought by the Coastal Development Company's Caylor 1, NW NW SE 6-17s-37e, on a 160-acre site farmed out by Phillips Petroleum Company. Stanolind Oil & Gas Company and Amerada Petroleum Corporation's Caylor 1, C NW SW 6-17s-37e, offsets a flowing well. Skelly Oil Company reduced its quota of required offsets in starting operations on State 2-O, near C E½ NW SW 31-16s-37e, and State 1-Q, C SE SE 36-16s-36e. Magnolia Petroleum Company's State 2-Q, which will require numerous progressive offsets, was drilling at 3170 feet.

Phillips Petroleum Company and Pure Oil Company's Woolworth 8, C NW NE 33-24s-37e, inside test for the Mattix field, is having difficulty in making an oil producer at 3565 feet, where the well tested 24 barrels of oil and 1,214,000 cubic feet of gas daily on brief gauge. Electrical formation survey established the gas zone at 3410-55 feet. The hole bridged after 112-quart nitro shot at 3534-62 feet. Skelly Oil Company's State 3-M, C NE SW 32-24s-37e, is a new project.

An east outpost for the Langlie field is to be drilled by Continental Oil Company in starting operations on State 1-A-2, C SW SE 2-25s-37e. Gulf Oil Corporation has started work on Stuart 7, SW NE NW 11-25s-37e.

New operations in the Hardy field include Magnolia Petroleum Company's E. O. Carson 7, C NE NW 33-21s-37e, and Skelly Oil Company's Hill 3, center lot 5, 6-21s-37e.

The Texas Company's State 4-N, C NW NW 30-17s-35e, an inside test, failed to flow steady after multiple acid treatments at 4750 feet, and is installing flow valves. Magnolia Petro-

New Mexico Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Eddy County—		
Friendship Oil Co., State 1, se se sw 36-17s-29e	600	2754
Underwood & Sanders, Miller 1, c se ne 5-18s-29e	240	2620
Eddy County (Wildcats)—		
Jones et al, Harbold 1, ne ne ne 26-17s-27e	*	540
Texwell Corp., Sullivan-Jaffa 1, c se sw 23-18s-31e	*	4107
Harding County (Wildcats)—		
Waddell & Casthwait, Peters 1, 31-15n-31e	*	2140
Lea County (Mattix)—		
Culbertson & Irwin, Martin 1	720	3540
Lea County (Monument)—		
Continental et al, Britt 7-B-15, near c w½ se sw 15-20s-37e	600	3864
Lea County (Vacuum)—		
Humble, State 6-K, c se se 32-17s-35e	1488	4665
Ohio, State-Warn 3, Acct. 3, c sw ne 33-17s-35e	1200	4550
Phillips, State-Hale 4, c se sw 35-17s-34e	594	4678
Skelly, State 1-P, c nw nw 33-17s-35e	1248	4653

*Failures; †Junked; ¶Million cu. ft. gas.

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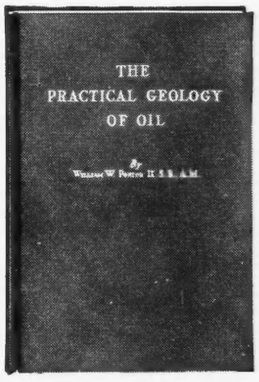

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leum Company has 3 tests nearing the final casing point on its State-Bridges discovery leasehold, and is scheduled to keep these rigs in continuous service. The company has made arrangements to have its production delivered on a common carrier basis to Magnolia Pipe Line Company in West Texas, thereby being relieved of market restrictions. Skelly Oil Company has made location for State 2-P, near C E½ NE NW 33-17s-35e.

In Harding County, A. S. Waddell et al's Peters 1, C SE NE 31-15n-31e, developed junked hole in drilling to 2140 feet. Top of San Andres lime was called at 675 feet, and shows of carbon dioxide gas were reported at 472 feet; 1485 feet and 1513 feet. Location is about 10 miles south of carbon dioxide gas production, and is on a 32,000-acre block. It is reported that Waddell et al will start a new test to fulfill a 3500-foot depth contract.

Want proration lifted in Sewell pool, Young County

Cosden Petroleum and Henry Zweifel, operators of the Sewell field in Young County, have asked the Texas Railroad Commission to suspend proration in their field in order that they might have sufficient oil for their Big Spring and Young County refineries.

Attorney Ed Bradford told the commission they could not buy the oil reasonably, that pipe lines charging 28 cents to run oil to the coast wanted 25 cents to bring it to Cosden's plants from 60 miles away.

He took the position that under the law the field could be exempt from proration until it was producnig at least 10,000 barrels per day. Production is from the Caddo lime, with three wells producing and several drilling.

Cosden products, Bradford said at the hearing, compete with Indiana and Illinois products, but the shortage of crude has threatened to lose them markets.

Rocky Mountains

Wertz field extension makes 1712-barrel flow

Casper, Wyo.—Sinclair-Wyoming Oil Company brought in its fourth and largest producer in the deep Tensleep pool, Wertz field, Carbon County, for a slight extension of the proved limits of the deep zone. The well, Wertz 13-A, NE NW NW 7-26n-89w, flowed 1712 barrels initial through ⅛-inch choke on 2-inch tubing. Hole bottoms at 6065 feet in saturation with the Tensleep topped at 5918 feet. The well is 200 feet north of the nearest producer.

In the Lance Creek field, Continental Oil Company brought in another good producer in the recently discovered second Sundance high to the east of Sundance participation limits of the field. The company's Tom Bell 16, NW SW SW 34-36n-65w, flowed 15 barrels per hour initial from Basal Sundance topped at 3951 feet and hole bottoming in sand at 3987 feet. The 6⅝-inch production string is set atop saturation at 3967 feet.

Continental Oil Company has two other east end Lance Creek wells completing in the Basal Sundance. Apex 4 OPC-3, NW NE SW 34-36n-65w, has run packer and is continuing to swab and clean out, pulling on Basal Sundance with bottom at 4073 feet. The well swabbed at around 100 barrels daily before running packer. Apex 4 OPC-4, SE SE NW 35-36n-65w, easternmost of the Lance Creek wells, is installing pumping equipment at 4296 feet in the Basal Sundance.

Continental Oil Company started three new Lance Creek wells last week. Otto Rohlff 10, SW SW SE 31-36n-65w, an inside location, is drilling below 2965 feet. Schuricht 9-B, NW SW SE 6-35n-65w, is rigging up rotary tools. Dielman 4-A, SW NE NE 7-35n-65w, is drilling at 1890 feet with 13-inch surface casing set at 315 feet.

On the west side of the field, A. B. Cobb's Novick 4, SE SW 6-35n-65w, is attempting to loosen frozen drill pipe on bottom at 4834 feet. The Ohio Oil Company has a near completion in Elizabeth Lamb 12-Account 2, NW SW SW 5-35n-65w, south side well, which topped the Minnekahta formation at 4806 feet and is coring at 5044 feet, feeling for the Leo sand.

O'Mahoney asked to revise public land regulations

Revision of Interior Department regulations governing oil operations in the public lands, both by hearings before the secretary of the interior and the enactment of new legislation, has been urged upon Senator Joseph C. O'Mahoney (Democrat, Wyoming) by the Independent Petroleum Association of America, it was disclosed at Washington last week by Russell B. Brown, general counsel of the association.

Brown made public a letter addressed to Senator O'Mahoney, in which it was pointed out that many members of the oil industry believe the present regulations to be discriminatory, a deterrent to wildcatting, and place the small operator at a disadvantage while tending to give to large or well-financed companies a practical monopoly of the public lands oil resources.

Further, it was contended, the regulations ignore the common procedure throughout the oil industry and do not appear to be reasonable applications of the law or to comply with the apparent intent of congress when it enacted leasing legislation.

Outlining some of the significant results which have attended the admin-

Mountain States Completions

COLORADO

Company, Well and Location	Init. Prod. Bbls.	Depth
Mesa County (Divide Creek)—		
Continental, California and Amerada, David B. Miller 1, sw sw nw 36-8s-91w	*	10,815
Rio Blanco County (Rangely)—		
Raven O&R Co., Government 23, nw sw ne 31-2n-102w	12	910
Government 24, s nw ne 31-2n-102w	63	961

MONTANA

Fallon County (Baker-Glendive)—		
Montana Dakota Utilities Co., 137, ne sw sw 10-6n-60e	¶1	924
Glacier County (Cut Bank)—		
A. B. Cobb, Vargo 1, cse ne 19-37n-4w	*	2753
G&A Oil Co., Krause 2, se se se 9-35n-2w	7	1789
Santa Rita O&G Co., Stahl 2, cnw sw 21-33n-5w	250	2966
R. C. Tarrant, Getty 8, cw nw se 15-34n-6w	75	2970
Toole County (Kevin-Sunburst)—		
Texas Co., Swears 8, ne se sw 9-35n-2w	125	1630

WYOMING

Fremont County (Plunkett)—		
Lincoln O&G Co., Tribal 5, csw se 23-1s-1e	1	1103
Niobrara County (Lance Creek)—		
Continental, Rodeo 6 OPC-4, nw ne 35-36n-65w	408	4090
Dielman 3-B, sw se nw 8-35n-65w	100	5715
Park County (Badger Basin)—		
Resolute Oil Co., Northern Pacific 1, cne sw 21-57n-101w	250	8679
Sublette County (Dry Piney)—		
Texas Co.-Frontier Pet. Co., Unit 1, se se sw 1-28n-114w	*	8194
Weston County (Osage)—		
Butcher Brothers, Fee 1, nw sw ne 16-46n-63w	3	208
Federal Oil Co., 9, cnl se se 15-46n-64w	20	2142

*Failures; †Junked; ¶Million cu. ft. gas.

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istration of the present law, Brown contended that:

"The small operator finds it more difficult to participate in the development of petroleum resources on our public lands. If these regulations make the road difficult for the small operators, they may make it easier for the large ones;

"The great exploration work in entirely new fields is being carried on under commercial leases to the detriment of public land states where lease requirements are much more complicated. The opening of the new Illinois field and the exploratory work in Missouri were made possible by the low rental charges, in many cases the maximum rental being less than the minimum required in the regulations of the interior department.

"The requirement of a preliminary bond, set forth in Section 2(A) of the lease, is discriminatory in that small operators must deposit in cash or its equivalent the amount of such bond, while companies which are strong financially may obtain a bond on their credit. No such bond is required by private landowners. This requirement does not serve any public interest but does give to large corporations a definite advantage while it handicaps, needlessly, the small operator. The requirement under this bond that the lessee should pay rental for the term of the lease, even though he has a dry well, is not equitable but penalizes those who have already suffered loss through failure to find oil."

There is considerable dissatisfaction with the rental and royalty requirements, Brown told the senator, and oil men are concerned "because of recently published statements about the position which the Department of the Interior is said to contemplate taking, by basing the royalty requirements on an advanced price for oil which is not now being generally realized by producers from public lands wells."

The experience of the industry also has shown that some other portions of the regulations are not achieving the desired results.

"Some of these appear unnecessary," the letter stated, "others are considered drastic, and some are conflicting."

These regulations include the requirement that the lessor must drill such wells as the secretary may require; that he can only sell his product under arrangements approved by the department; that he must be diligent in drilling and producing unless the secretary permits him to suspend operations; that the secretary can control the rate of prospecting and developing and producing; that the lessee must agree to conform to regulations which may hereafter be adopted; and that the present forfeiture rule unequitably would take materials, tools, machinery, appliances, structures, etc.

These matters, it was suggested, might well be considered at hearings before the secretary designed to bring about changes which would make the regulations and lease form conform to the common practice of the industry, and it might also be desirable to enact new legislation which would encourage exploration of the public domain for oil and thus facilitate the creation of new reserves.

Delbridge says reserves enough for 150 years

Basing his prediction of future crude oil reserves upon the inadequacy of estimates of reserves made by experts in past years, T. G. Delbridge, petroleum technologist and president of the American Society for Testing Materials, offers the petroleum industry to those planning their future business careers as providing a "more permanent outlet for hard work and keen competition than any other business other than food and politics." He declares crude oil reserves sufficient to supply the nation's need for probably 150 years assures its permanency.

"In the past 30 years successive estimates have indicated almost immediate exhaustion of crude oil," Delbridge said. "Had the estimate of 1908 been accurate, the nation would have no crude oil today. If the 1918 estimate had been correct, the country's petroleum would have been exhausted about nine years ago. Yet the estimate for January 1, 1939, was 17,348,000,000 barrels, the highest in the history of the country.

"Advanced methods of exploration, drilling, production and refining are not only increasing the proven reserves, but are opening up almost unsuspected possibilities in future reserves not yet proved. New methods are being applied to old fields believed to be exhausted, and they again are in production. In one Pennsylvania field, water repressuring methods have demonstrated a reserve for future production greater than all the oil taken from that field in the last 70 years."

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California

Will drill deep test east of Venice townlot area

Los Angeles.—East of the old Venice Townlot field in an area where Frederick Libby once explored to 7563 feet to obtain 250 barrels of 28-gravity oil and considerable water and where several other wildcats obtained shallow marsh gas showings, Vulcan Oil Company has staked location for a deep test near the intersection of Lincoln Drive and Culver Boulevard. The test is described as one of the most interesting projects announced for Los Angeles Basin in recent years.

West Montebello Extension, with 63 active operations and a widening lease play, continues the busiest field in the basin. The number of rigs drilling for 7600-foot production is expected to increase if leasing and farm-out transactions hold to current levels.

With three sides of Rio Bravo field in Kern County already defined, Superior Oil Company is endeavoring to expand production limits on the northwest, where the company's Fink 1, the first test in Section 27-28-25, has found the top of the Rio Bravo sand at 11,350 feet, a little lower than it is found in some wells. Some believe the structure along the northwest edge of the field plunges down or flattens out.

In the recently discovered Calders Corner area, structure of which is supposed to roughly parallel that of nearby Greeley field, Standard Oil Company of California completed a flow test on KCL 12 in Section 30-29-26 to obtain a daily rate of 1650 barrels of oil with a slight cut. Later the well produced 3850 barrels daily. Petroleum Securities Company has moved a rig into the area.

Graphic Oil Corporation has been organized to prospect a 1500-acre block in the Dudley Ridge section of Kings County; location for a projected 10,000-foot test has been staked in SWc Section 34-23s-20e. Either Seaboard Oil Company or Shell Oil Company is expected to spud a test in the neighborhood within a year.

California Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Los Angeles County (Athens-Rosecrans)—		
Royalty Service, Gordon 4	122	7890
Los Angeles County (Dominguez)—		
Shell, Reyes 32	360	4335
Orange County (Huntington Beach)—		
William Brayton, Johnson 1A	140	4575
Pacific American Oil, No. 5	47	3801
Los Angeles County (Montebello West)—		
Standard, Harvey 4	1056	7610
Union, Paul Howard 5	615	7620
Wilcox 4	650	7648
Los Angeles County (Richfield)—		
Union, Y. L. G. 18	27	3141
Los Angeles County (Wilmington)—		
General, Ford 40	1080	4180
Long Beach Oil Dev., "X" (LB) 10	250	3870
"Z" (LB) 2	250	2867
Richfield, Pacific Dock (LB) 28	495	2900
Ring Oil, No. 3	387	5718
Signal, Signal-LB-SP (LB) 2	550	4110
Kern County (Greeley)—		
Standard, KCL 12-6	4212	11,942
Kern County (Trico)—		
Trico O&G Co., T. G. T. 2	¶23	2443
Kern County (Round Mountain)—		
Grizzley Bear Pet. Co., Kell 63	35	1709
Kern County (Ten Section)—		
Shell, KCL B-23-28	2414	8220
Ventura County (Sespe)—		
J. A. English, Lankershim 2	50	2502
Ventura County (Ventura Avenue)—		
Tide Water Associated, Lloyd 124	1082	10,230
Los Angeles County (Aliso Canyon)—		
Union, S. S. Orcutt 27-1	*	5980
Kern County (Buttonwillow)—		
California Exploration, Calif-Lands-Dougherty-Salisbury 1	*	12,989
Kern County (Midway Sunset)—		
Par O&G Co., No. 1	*	3940
Solano County (Rio Vista)—		
Standard, Calif-Packing Corp. 1	*	6837

*Failures; †Junked; ¶Million cu. ft. gas.

Union stops running Santa Maria crude

Union Oil Company has notified producers in the Santa Maria Valley field, California, of its intention to cease buying local oil, the order becoming effective August 7. Some months ago, the company agreed to take 10,000 barrels daily, provided a moratorium was declared on drilling. The company will continue to move crude from its own wells in the field, about 3800 barrels daily.

Illinois Geological Survey publishes two bulletins

Illinois State Geological Survey last week announced publication of two bulletins: Bulletin No. 33, "Oil and Gas Development in Illinois in 1938," was prepared by Dr. Alfred H. Bell, head of the survey's oil and gas division. It is available for the cost of postage, amounting to 1½ cents. Bulletin No. 34, "Recent Development in Illinois with Discussion of Producing Formations below McClosky Sand," is by Dr. Bell and George V. Cohee. The postage charge is 3 cents.

Order includes Wyoming Township in Walker field

P. J. Hoffmaster, supervisor of wells, issued an order, effective July 21, under the 21-day emergency clause of the oil act, including Wyoming Township, Kent County, as part of the Walker field. Wyoming joins Walker on the south.

The order was issued, Hoffmaster said, because certain operators were attempting to take advantage of a technicality to circumvent proration applied in the Walker field. Two operators who had completed wells less than ¼ mile from the Wyoming Walker Township line, but in Wyoming, had claimed exemptions from the old order on the grounds their locations were outside the designated pool.

At the same time, Hoffmaster included adjacent townships to Walker into the "common pool." The emergency order read ". . . This shall not be construed to limit the pool or field to the township or county designated, but the pool or field so designated shall include all of the area containing a common accumulation of oil or gas or both as defined . . . the Walker pool or field is hereby declared to include Wyoming Township, as well as Walker Township, Kent County, and it shall also include Tallmadge Township of Ottawa County, should the pool or field extend to that township; and the New Salem pool or field shall include Jamestown Township of Ottawa County, should the pool or field extend to that township."

Michigan Fields

Tallmadge Township test producing from Traverse

Mt. Pleasant, Mich.—Smith Petroleum Company & Strom-Wagner Trustees' Wisniswski 1, SE SE SW Section 27-7n-13w, Tallmadge Township, Ottawa County, 4 miles west of the developed Walker field, Kent County, increased from 9 to 52 barrels a day after a 250-gallon acid treatment. The wildcat, most promising for opening of a new field drilled since spring, is producing from Traverse limestone at 1894 feet.

D. F. Jone's Smith 1, SW SW SW Section 9-1n-8w, Johnstown Township wildcat, Barry County, had free oil in the Berea and was cased at 1810 feet for a Traverse lime test. Lime was tentatively checked at 1808 feet to place it 91 feet higher than correlating tests 2 miles out. Barry County adjoins Allegan on the east and Kent on the southeast. It has been wildcatted some already and has been one of the chief areas for major company leasing this year. There are no commercial wells in the county.

Michigan Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Allegan County—		
Rowmor Corp., Poelakker 1, sw sw ne 9-4n-14w	*	1498
Socony Vacuum, Loew 2, sw sw se 3-4n-13w	225	1617
Markulic 1, se ne se 15-4n-13w	550	1581
Vic R. Wilson, Loew 1, se nw se 3-4n-13w	*	1680
Salem Oil Co., Dean-Byers 2, nw sw ne 22-4n-13w	150	1587
J. V. Wicklund, Smith 2, se ne ne 22-4n-13w	400	1571
Arenac County—		
Weber Oil Co., Dodge 3, sw se sw 4-20n-4e	45	2578
Berrien County—		
Alfred Violette, Warren 1, nw ne ne 8-8s-20w	*	1401
Kent County—		
J. V. Wicklund, Davis 1, sw sw sw 10-9n-11w	*	2767
Majestic Oil Co., Moorman 1, nw nw sw 6-5n-12w	*	1960
Al Fleming, Whalen 1, se ne se 31-7n-12w	40	1889
Ide & Glavin, Reinhan 1, sw sw se 33-7n-12w	90	1788
Smith & Strom-Wagners, Gilbert 4, se se nw 4-6n-12w	3100	1773
Wolverine Nat. Gas Co., Thomasma 3, se sw nw 4-6n-12w	2600	1779
Orlik 3, nw nw ne 5-6n-12w	175	1833
Fortney Oil Co., Land Assn. 1, sw sw se 23-6n-12w	*	2211
Basin & Grodon's, Groen 1, se sw sw 11-6n-12w	*	1900
Van Buren County—		
J. S. Brailey, Jennings 1, c n ne nw 11-2s-13w	*	1321
W. J. Soverign, Nuttling 1, se ne se 20-2s-16w	*	1011
Clark & Johnson, Maier 5, c s nw se 14-1s-14w	150	1278
T. H. Ferguson, R. R. 4, sw nw se 18-1s-14w	80	1202
Bloomingdale Dev. Co., West B-1, nw se ne 18-1s-14w	*	1276
Forest Ruby, Teal 1, sw se sw 1-1s-15w	*	1222
Fisher & McCall, Moorhead 4, se nw ne 12-1s-15w	900	1185
A. Kooprasch, Cooley 2, nw nw se 13-1s-15w	860	1211
Clapsaddle & Harris, Rone 2, nw ne se 13-1s-15w	45	1203
J. F. McGovern, Nielson 1, nw ne sw 24-1s-15w	39	1178
J. H. Fitchett, Fox 2, sw nw ne 13-1s-15w	1100	1208
Hagan & Hagans, Voss 1, nw nw ne 3-2s-14w	*	1495

*Failures; †Junked; ¶Million cu. ft. gas.

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WILDCAT REPORT
New Starts and Completions

STATE	WILDCATS STARTED		WILDCAT TESTS COMPLETED							
			Total		Oil		Gas		Dry	
	This Week	This Year	This Week	This Year	This Week	This Year	This Week	This Year	This Week	This Year
Alabama	...	3	...	1	...	...	...	...	...	1
Arkansas	2	20	...	14	...	1	...	...	...	13
California	4	139	...	67	...	20	...	2	...	45
Colorado	...	1	...	1	...	...	...	...	...	1
Florida	...	1	...	1	...	...	...	...	...	1
Georgia	...	3	...	1	...	...	...	...	...	1
Illinois	14	344	5	247	...	18	...	...	5	229
Indiana	...	20	2	22	...	8	...	1	2	13
Kansas	4	152	7	134	1	45	...	4	6	85
Kentucky	...	11	...	13	...	7	...	...	...	6
Louisiana	2	74	4	60	...	10	1	1	3	49
North Louisiana	2	25	1	17	...	3	1	1	...	13
South Louisiana	...	49	3	43	...	7	...	...	3	36
Michigan	7	132	7	184	...	15	...	...	7	169
Mississippi	...	8	...	5	...	...	...	...	...	5
Missouri	8	32	...	1	...	...	...	...	...	1
Montana	...	2	...	2	...	...	...	...	...	2
Nebraska	...	1	...	...	...	...	...	...	...	...
New Mexico	1	23	3	16	...	1	...	1	3	14
New York	...	...	...	3	...	1	...	1	...	1
Oklahoma	8	110	4	109	...	14	...	5	4	90
Ohio	...	4	...	8	...	1	...	...	...	7
Pennsylvania	...	3	...	2	...	...	...	...	...	2
South Dakota	...	1	...	...	...	...	...	...	...	...
Texas	36	644	29	674	2	68	...	10	27	596
East Texas	1	74	4	60	...	3	...	1	4	56
North Texas	2	87	4	140	...	23	...	1	4	116
Gulf Coast	4	68	2	55	...	5	...	1	2	49
Panhandle	...	7	...	6	...	...	...	...	...	6
South Texas	26	280	11	289	2	23	...	6	9	260
West Texas	3	128	8	124	...	14	...	1	8	109
Utah	...	1	...	...	...	...	...	...	...	...
West Virginia	...	2	...	1	...	...	...	...	...	1
Wyoming	...	4	...	1	...	...	...	...	...	1
Total U. S.	86	1,736	61	1,574	3	209	1	25	57	1,340

ARKANSAS

FIRST REPORTS

Independence County—C. P. Daniels, Kelly Wyatt et al 1, 52 ft e and 1080 ft s of c 16-12n-5w, rig.

Pulaski County—Coker Oil Corp. of Ark., Huffman Est. 1, 330 ft s and e nwc nw sw sw 29-4n-11w, materials.

CALIFORNIA

FIRST REPORTS

San Benito County—Silver Creek Oil Co.'s No. 1, nwc 11-17-11, lcn.

Kern County—Baker, Leyse & Sonne's No. 1, nw ne 20-32-23, Midway area, lcn.

Kern County—Kern Valley Drilling Co.'s No. 1, c 4-29-29, Upper Kern River area, lcn.

Colusa County—Empire Oil & Gas Corp.'s Dunlap 1, ne se 36-16n-5w, lcn.

ILLINOIS

FIRST REPORTS

Clinton County—J. J. Lynn et al's Western Catholic Association 1, sw sw ne 4-1s-5w, dk.

Crawford County — Kingwood Oil Co.'s Walker 1, se ne se 23-7n-11w, rig.

Madison County—Lakeview Oil Co.'s Kaseberg 1, sw se se 21-3n-9w, dr.

Marion County—Quisenberry et al's E. F. Hawkins 1, nw nw 32-1n-4e, Romine tnp, rig. Papoose Oil Co.'s J. I. Weems 1, ne ne se 19-1n-4e, Romine tnp, loc.

Montgomery County—Frank Brown et al's Fogleman 1, nw sw ne 22-9n-5w, North Litchfield tnp, standing at 330 ft. W. M. Meyer's Redman 1, se se ne 29-9n-2w, Witt tnp, dr. Jack S. Brown's C. W. Hefley 1, sw se se 4-9n-3w, Irving tnp, standing at 420 ft.

St. Clair County—Matches & Leach's Bear 1, se nw sw 23-2n-6w, dr.

Schuyler County—D. K. Reed's J. P. Long 1, se se 28-1n-2w, dr.

Wabash County—Oil Exploration Co.'s F. Basecker 1, ne se nw 13-2s-14w, loc.

Washington County—Armer et al's Neudecker 1, se ne 33-3s-1w, rig.

White County—Sun Oil Co.'s H. J. Garner 1, sw sw 1-5s-10e, rig.

Williamson County—J. Curtis Starr's Shoemaker 1, c se nw 21-9s-4e, moving in materials.

COMPLETIONS

Clinton County — Elmer Goldschmidt's Burger 1, ne ne nw 12-2n-4w, Breese tnp, abnd at 1302 ft in lower Mississippian.

Franklin County—Palacine Oil Co.'s Old Ben Coal Corp. 1, nw ne ne 4-5s-2e, Barren tnp, top Aux Vases 2731 ft, abnd 3097 ft.

Jasper County—Tompson Drilling Co.'s Union Central Life Insurance 1, c se se sw 14-8n-10e, Crooked Creek tnp, top Benoist 2259 ft, top Aux Vases 2300 ft, top Fredonia 2427 ft, abnd 2500 ft.

Perry County—C. H. Blankenship's Rheinecker 1, nw nw ne 3-6s-4w, Cutler tnp, top Benoist 1318 ft, abnd 1350 ft.

Wayne County—New Penn Development Co.'s C. A. French 1, nw nw nw 14-2s-9e, Leech tnp, top Fredonia 3321 ft, abnd 3438 ft.

INDIANA

COMPLETIONS

Gibson County—Pete Thorp & J. K. Cleary's J. P. Ballard 1, ne ne se 18-2s-10w, abnd 2111 ft without showing. Lewis & Armstrong's (Ladd Oil Co.'s) Blair 1, ne ne sw 8-2s-11w, Patoka tnp, abnd without show at 2353 ft.

KANSAS

FIRST REPORTS

Barton County — Crown Petroleum Co.'s Marchand 1, ne se nw 13-20s-12w, lcn.

Butler County — Crown Petroleum Co.'s Manny 1, nwc se 33-28s-5e, lcn.

Cowley County—Cohen et al's Sandstrum 1, swc ne 23-33s-6e, ru machine.

Greenwood County—Reed's Sowders 1-A, nec sw 31-25s-13e, dr.

COMPLETIONS

Barton County—B. B. & M. Co., Esfeld 1, nwc se 28-16s-11w, 4 mi s Davidson pool, top Arbuckle lime 3337 ft, td 3345 ft, completed, 5189 barrels, gr 41.

Greenwood County—Enright et al's Schwab 1-A, se sw se 9-24s-10e, nw Parks pool, top Kansas City 1637 ft, estimated 1 bbl, 1637-1648 ft, abnd 1750 ft. Sheedy's Fee 1, c e½ ne nw 13-25s-12e, s Quincy pool, top Mississippi 1722 ft, abnd 1755 ft.

Reno County—Herndon Drilling Co.'s Compton 1, c el se nw 31-25s-10w, 4 mi se Neola pool (abnd.), top Topeka 3010 ft, top Lansing 3540 ft, top Mississippi 3965 ft, top Viola 4200 ft, top Simpson 4300 ft, top Arbuckle 4370 ft, abnd 4400 ft.

Rice County—Weaver's James 1, ne nw sw 25-19s-10w, west Chase pool, top Lansing 2965 ft, top Conglomerate 3275 ft, top Arbuckle 3293 ft, abnd 3301 ft.

Russell County—Braden et al's Blehm 1, swc nw 11-14s-14w, e Williamson pool, top Lansing 3022 ft, sso 3082 ft, top Gorham sand 3287 ft, hfw 3295-3300 ft, abnd 3300 ft. Shell Oil Co.'s Berrick "A" 1, nwc se 13-15s-13w, top Arbuckle lime 3346 ft, abnd 3386 ft.

NORTH LOUISIANA

FIRST REPORTS

Caddo Parish—Prairie River Synd.'s Hutchinson B-2, 4055 ft n and 480 ft e swc 3-15n-12w, dk and moving in rig.

Natchitoches Parish—W. N. DeSoto et al, Blackshear 1, nw ne sw 27-10n-9w, lcn abn.

COMPLETIONS

Bienville Parish—Ark. Fuel Oil Co., Gayoso 2, c sw se 14-16n-10w, elev 188 ft, top Nacatoch 983 ft, massive anhydrite 3898-4135 ft, top Travis Peak 5432 ft, top lower Marine (Cotton Valley) 7850 ft, completed 3 mil ft wet gas daily show distillate, td 8532 ft.

SOUTH LOUISIANA

COMPLETIONS

Avoyelles Parish—Adams Oil & Gas Co.'s Poor Farm 1, Marksville area, 500 ft fr s line and 500 ft fr se line of lease in sec 8-2n-4e, topped Wilcox 5632 ft, cored salt water, abnd 6599 ft.

Beauregard Parish—Atlantic's Rice Land 1, Merryville area, 330 ft s and 330 ft w of

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nec se¼ ne¼ sec 22-3s-11w, dr 8516 ft, made tests in Wilcox and Sparta sands and showed salt water, abnd.

Jefferson Davis Parish — Union Sulphur's Tietje 1, China area, 330 ft s and 330 ft e of nwc sec 36-7s-4w, dr to 9220 ft, pb and made series of tests, last being at 7512 ft, salt water, abnd.

MICHIGAN
FIRST REPORTS

Allegan County—L. A. Shimmel's Lloyd 1, ne ne nw 21-3n-15w, rig.

Bay County—C. W. Teater's Jozwiak 1, ne sw 34-18n-3e, dr.

Berrien County—E. K. Emlong's Mean 1, 15-6s-19w, rig.

Kalamazoo County — Twin Drilling Co.'s Upjohn 2, ne ne 6-2s-10w, dr. McClanahan Oil Co.'s Sweet 1, sw se sw 27-3s-11w, dr.

Kent County—Sun Oil Co.'s Christensen 1, ne ne nw 27-6n-11w, dr.

Ottawa County—Hugh White's Rodenhisler 1, ne ne sw 36-5n-13w, dr.

COMPLETIONS

Berrien County—A. Violette's Warren 1, nw ne ne 8-8s-20w, Monroe 1348 ft, abnd 1401 ft.

Kent County—J. V. Wicklund's Davis 1, sw sw sw 10-9n-11w, Trv. 2281, Dundee 2666 ft, abnd 2765 ft. Majestic Oil Co.'s Moorman 1, nw nw sw 6-5n-12w, abnd 1960 ft. Fortney Oil Co.'s Land Assn. 1, sw sw se 23-6n-12w, Traverse 1805 ft, abnd 2211 ft.

Van Buren County—J. S. Bradley's Jennings 1, c n ne nw 11-2s-13w, abnd in Traverse 1321 ft. W. J. Sovereign's Nuttling 1 se ne se 20-2s-16w, abnd in Traverse 1011 ft. Hagan & Hagans' Voss 1, nw nw ne 3-2s-14w, abnd in Traverse, 1495 ft.

MISSOURI
FIRST REPORTS

Adair County—Mayson Oil Co.'s McGonigle 1, cnl se nw 20-63n-13w, dr.

Carroll County—Loomis et al's Hicks 1, sw se sw 30-55n-24w, sd 205 ft.

Cass County—Lewis et al's Blair 1, nec 29-46n-33w, dr.

Chariton County—Buttram et al's Vance 1, nwc se 35-53n-18w, rig.

Grundy County—Franklin et al's Vencill 1, nec 20-62n-22w, pits.

Harrison County—Elwell et al's Moulin 1, nwc ne 10-62n-26w, lcn.

Putnam County—Dittman et al's Houston 1, nw sw ne 26-65n-19w, mi materials.

Ray County—Featherlin et al's Penny 1, c w½ ne 1-53n-27w, sd 100 ft, for csg.

COMPLETIONS

Clinton County—C. E. King et al's Willis 1, ne se se 13-55n-32w, top Mississippi 995 ft, top Kinderhook 1323 ft, top Hunton 1391 ft, hfw 1398-1406 ft, top Viola 1667 ft, top St. Peter (Wilcox) 1769 ft, top Arbuckle 1860 ft, water 1868-73 ft, abnd 1886 ft.

Putnam County—Slater et al's Sayer 1, ne nw se 14-65n-18w, top Arbuckle lime 1608 ft, abnd 1685 ft.

NEW MEXICO
FIRST REPORTS

Eddy County—B. H. Nolen et al's Isles 1, ne ne ne 17-16s-29e, lcn.

COMPLETIONS

Eddy County—Texwell Corp., Sullivan-Jaffa 1, c se sw 23-18s-31e, elev 3670 ft, abnd 4107 ft. C. L. Jones et al's Harbold 1, near ne ne ne 26-17s-27e, elev 3571 ft, abnd 540 ft.

Harding County — Waddell & Castwait's Peters 1, 31-15n-31e, abnd 2140 ft.

OKLAHOMA
FIRST REPORTS

Choctaw County—Letchfield et al's Schsusler 1, sw se sw 13-6s-14e, dr.

Creek County—Sunray Oil Co. et al's Harris 1, swc ne 30-14n-7e, dr.

Kiowa County—Haggerling et al's Bozeman 1, sec ne 14-5n-18w, dr.

Love County—Love Oil Co.'s Wilxon 1, nwc sw 35-6s-2e, lcn.

Marshall County—Johnson et al's Neff-Godfrey 1, sw se ne 14-6s-6e, lcn.

Oklahoma County — Jones, Soper et al's Dramer Estate 1, nec 17-12n-1w, rur.

Pontotoc County—Grisso Royalty Co. et al's Hashins 1, se sw sw 27-5n-4e, lcn.

Pottawatomie County—Curtis Oil Co. et al's Townsend 1, nw sw sw 28-6n-5e, dr.

COMPLETIONS

Cleveland County—Hall et al's Mantooth 1, nwc 24-6n-1e, six mi w Wanette, top Hunton 5580 ft, top Sylvan 5830 ft, top Viola 5950 ft, top Dense 6230 ft, top second Wilcox 6322 ft, abnd 6387 ft.

Grant County—Smythe et al's State 1, c se sw 16-25n-4w, six mi w Lamont pool, top Layton 4215 ft, top Mississippi 5267 ft, top Chat 5885 ft, top Dolomite 5925 ft, top first Wilcox 5945 ft, top second Wilcox 5995 ft, top Tyner 6180 ft, abnd 6215 ft.

Kay County—Roy Starr's State 1, nec sw 13-29n-2w, two mi sw Braman pool, top Mississippi 3638 ft, top Arbuckle lime 4025 ft, abnd 4075 ft.

Seminole County—Stanolind Oil & Gas Co.'s McMahon 1, nec se 12-9n-7e, top Earlsboro 2679 ft, top Booch 3220 ft, top Wapanucka 3502 ft, top Cromwell 3520 ft, abnd 3538 ft.

WEST TEXAS
FIRST REPORTS

Howard County—M. A. Ooley et al's Read 1, ne ne nw T&P sec 36, blk 30, T-1-N, machine.

Irion County—P. I. Fox et al's J. M. Nutt 1, 1921 ft fr n and 1625 ft fr w lines sec 5, Gonzales C.S.L. sur, lcn.

COMPLETIONS

Crockett County—Steel Dust Oil Co.'s Geo. D. Atwood 1, nw se nw T. C. Ry. sec 9, blk PP, elev 2274 ft, top anhydrite 355 ft salt section 460-945 ft, top Yates sand 960 ft, top lime 1555 ft, abnd in sul w 1613 ft.

Jones County—Shaheen Oil Co.'s W. A. Minter 1, 2806 ft fr n and 300 ft fr w lines T&P sec 41, blk 15, abnd 2530 ft.

Pecos County — R. G. Patillo-Sahara Oil Corp.'s W. T. Gilworth-Gulf 1, 330 ft fr n, and sw lines H&GN sec 90, blk 10, elev 2[illegible] ft, top salt 880 ft, top Yates sand 1280 ft trace o&g 1672-85 ft, abnd 1910 ft, with n water at bottom. Magnolia Pet. Co.'s H. J. Eaton-Abell 2, 493 ft out of east corne. H&TC sec 23, blk 3, elev 2424 ft, base sal 1205 ft, top Yates 1370 ft, top Yates frosted grains 1390 ft, top brown lime 1295 ft, missed Simpson section, top Ellenberger 5115 ft tested water 5160½-71 ft and abnd.

Sutton County—Geo. Irvin et al (was Basse Sackett's) Miers 1, c ne TW&NG sec 54, bl 14, elev 2307 ft, abnd 302 ft.

Yoakum County—Wm. Hudson and Cha

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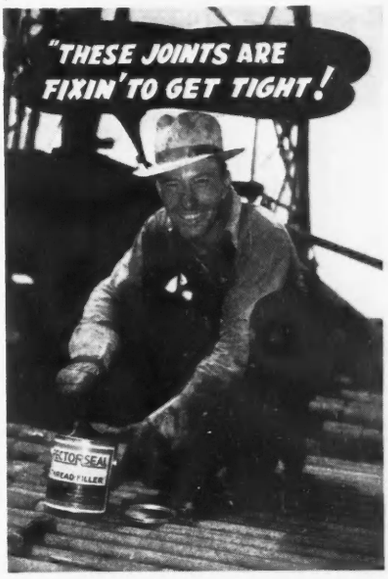

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Million's J. D. Webb 1, c ne sw sec 545, blk D, J. H. Gibson sur, elev 3685 ft, top anhydrite 2340 ft, top Yates 3140 ft, top brown lime 4185 ft, top solid lime 4640 ft, abnd 5502 ft.

WEST CENTRAL TEXAS
FIRST REPORTS

Mills County—C. D. Lane et al's J. W. Spink 1, 450 ft s and 1530 ft w of nwc sec 5, but in John Douglas sur, lcn for 2000-ft test.

COMPLETIONS

Callahan County—L. A. Warren et al's R. D. Williams 1, 960 ft fr n and 2950 ft fr w lines S. P. Ry. sec 302, elev 1599 ft, pumped 7 bbls oil and 2 bbls water initial from sand 590-95 ft.

Hood County—Prince & Miller's Andrews 1, Geo. Sutherland sur Pat. No. 3-5134, abnd 830 ft.

Lampasas County—J. R. Starrett, Tr., et al's A. M. Smith 1, 1200 ft fr s and 6550 ft fr e lines of sec 48, D. W. Biggs sur A-37, top Ellenberger lime 764 ft, used acid and abnd 841 ft.

NORTH TEXAS
FIRST REPORTS

Collin County—Sam L. Thomas et al's Tom Newsome 1, near c of n-50 acres of e-70 acres of 171-acre tract, or 1500 ft n and 2500 ft e of sec of Geo. Joy sur, but in BBB&C Ry. sur, rur.

Cooke County—Trumter Oil Co.'s F. Hess 1, 150 ft fr s and 1200 ft fr e lines of east 113.9 acres of north 227.8 acres of P. Lewis sur A-565, fsh 377 ft.

COMPLETIONS

Baylor County—British-American Oil Prod. Co.'s F. C. Green 1-L, 1500 ft out of sec H&TB sec 8, A-1376, center lot 27, J. E. Hox sur, abnd 4304 ft.

Jack County—B. C. Gilmore et al's L. Carter 1-B, 150 ft w of nec sec 3311, TE&L Co. sur, abnd 387 ft. Leach & Hord's J. P. Hoefle 1, 450 ft out of sec of T. M. Jackson sur A-2157, abnd 475 ft.

Montague County—Sinclair Prairie's Gould Whaley 1, 2720 ft fr n and 1170 ft fr w lines BBB&C sec 16, A-86, 2 miles e of Nocona, top Caddo 5165 ft, top Ellenberger 5512 ft, abnd 5570 ft.

Throckmorton County—Marland-Drake Oil Co.'s Mrs. G. H. Cobb 1, 330 ft out of nwc e½ sw¼ sec 96, J. F. Benson sur A-725, abnd 3349 ft.

EAST TEXAS
FIRST REPORTS

Navarro County—S. Relle et al's Carlos Berry 1, 300 ft out of s conrer of 35-acre tract and W. W. Moss sur, 1 mile nw Dawson, dk.

COMPLETIONS

Anderson County—J. C. Cook Drl. Co.'s Ezell-Copeland 1, 1319 ft fr e and 3302 ft fr s lines of N. Hanson sur, top Carrizo 902 ft, abnd 1020 ft.

Kaufman County—H. W. McGee et al's Santone Joint Land Co. 1, 4600 ft fr w and 6650 ft fr s lines of E. Higdon sur, elev 324 ft, Austin chalk 2010-2450 ft, abnd in Woodbine series 3336 ft.

Navarro County—Topaz Oil Co.'s E. Trammel 1, 950 ft fr nw and 9660 ft fr sw lines of R. Matthews sur, 4 mi ne Bazette, elev 296 ft, Pecan chalk 1600-76 ft, top Austin (broken) chalk 2137 ft, hard chalk 2275-2708 ft, top Woodbine series 3060 ft, top sand 3159 ft, abnd 3168 ft.

Van Zandt County—F. A. Richardson-O. T. Clark et al's B. C. Dodd 1-a, 4700 ft fr w and 150 ft fr s lines of T. W. Hutchinson sur, 2 mi s Grand Saline, first hole junked 4292 ft and skidded dk 75 ft nw, elev 429 ft, Pecan chalk 2765-2865 ft, Austin chalk 4052-4363 ft, abnd 4963 ft.

SOUTH TEXAS
FIRST REPORTS

Atascosa County—Raymond Pulliam and Joe L. Dickson's Henke 2, 660 ft n line, 330 ft w line of 75-ac tr, A. S. Donavan sur, lcn.

Bee County—Dirks Brothers and Richardson's West 1, 330 ft s line, 530 ft w line of 580-ac tr, James Douglas sur, rigging up.

Bexar County—S. K. and C. Production Co.'s Barker 1, 150 ft s line, 150 ft w line of 200-ac lse, Jose Maria Becerra sur, sec 58, spudded.

Caldwell County—Adams and Lyles' Campbell 1, 190 ft ne line, 150 ft se line of 182-ac lse, Gideon Pace sur, spud in.

Goliad County—John G. Mayo's Swickheimer 1, 330 ft s line, 330 ft w line of blk 20, subd of Swickheimer Land, Cuadrilla Irrigation Co. sur, lcn.

Guadalupe County—Edward Steves, Jr., Tr.'s Tiemann 1, 150 ft n and 150 ft e at rt ang fr se cor of Troell, 202-ac tr in 69-ac lse out of 474.3-ac tr, John Sowell sur 16, rigging up.

Jackson County—Moore & Ahern and Cron & Gracey's Heard 1, 466 ft nw line, 466 ft sw line of 100-ac tr, Morris and Cummins sur 13, lcn.

La Salle County—Eugene Garner's Yeager 5, 330 ft s line, 330 ft w line of blk 8, sec 7, W. H. Wallace subd of Louis Yeager Ranch, J. T. Doswell sur 111, lcn.

Live Oak County—Sal Vieja Oil Corp.'s Rizer 1, fr ne cor of sur 192, 330 ft n along w line of sec 382; thence e 330 ft at rt ang to lcn, in A. Moore sur 382, lcn. Smith and Story, Inc.'s Lyne 1, Jacob Cook sur 171, 7 mi sw George West, lcn.

McMullen County—Edwin M. Jones' Ezzell 96, 330 ft s line, 330 ft w line of sec 4, Ezzell Ranch subd, rigging up.

Refugio County — Sunset Oil Co. et al's Heinen 1, 330 ft e line, 660 ft s line of 240-ac tr and sec 10, Bonnie View Ranch subd, Jose Maria Aldrete and Jose Miguel Aldrete gr, ab 2 and 3, spudded. Transwestern Oil Co. and Trinity Drillers, Inc.'s Wood et al 1, 467 ft n line, 554 ft w line of 40-ac tr in R. H. Wood Mission River Ranch subd, Dona Anastacia Rejoas sur, rigging up.

San Patricio County—Republic Natural Gas Co. and Byron Rife's Goller 1, center of s 20-ac w½ ne¼ sec 26, fourth addition to Taft Farm lands, dk, moving in rig. Republic Natural Gas Co.'s Phillips 1, sec 60 George H. Pauls subd of Coleman-Fulton Pasture Co. lands, prep to work over and comp as gasser.

Starr County—Herbert Aid's Morenes 1, 150 ft n'ly s line, 150 e'ly e line of share 19, porc 70, Jurisdiction of Carmargo, drilling 750 ft. R. C. Hillman's Gonzales Heirs 2, 330 ft n and 165 ft e at rt ang fr se cor of sh 239, but in sh 43, porc 70, spudded. T. E. Stevens' Guerra 1, 200 ft n and 150 ft w at rt ang fr ne cor of tr 261, but in tr 253, porc 69, rigging up.

Travis County—Duke C. Matthews' Burke 1, 958 ft nw lines, 775 ft sw line of 119-ac tr, A. C. Caldwell sur, lcn. C. A. McEachem's Fee 1, 150 ft w line, 330 ft n line of — ac tr, Oliver Buckman sur, lcn. G. C. Richardson's Perry 1, 225 ft e line, 3494 ft n line of 170-ac lse of A. C. Caldwell sur, lcn. A. C. Schram's Peterson 1, 366 ft n line, 234 ft w line of 52-ac lse, lcn.

Val Verde County—W. A. Miller's Emory and Len Davis 1, sur No. 4, sec 2886, 4 mi sw of Prince No. 1 Harrison, dr 386 ft.

Victoria County—Tom L. Gunter's Dietzel 1, 1 mi e of Colleto Creek field, rigging up. John G. Mayo et al's Edwards 1, 330 ft n line and 330 ft w line of 2870-ac tr, Desiderio S. Mira sur, preparing to move in.

Webb County—James M. Anderson's Benavides 3, 330 ft n line, 330 ft e line of ne¼ of ne¼ of sec 692, lcn.

Williamson County—L. M. White's Sitman

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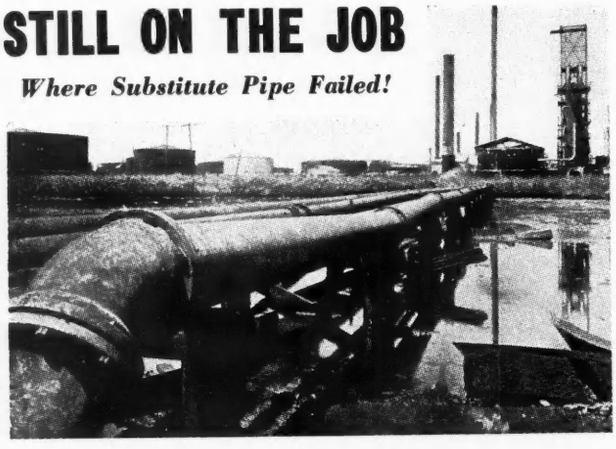

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Cameron County—V. D. Wedegartner, Tr.'s Sams-Porter 2, 925 ft s line, 980 ft w line of ne cor of blk "D," of the Sams-Porter subd, temp abnd at 1160 ft.

Comal County—North Sweden Oil & Royalty Co.'s Gruene 1, 150 ft ne line, 150 fe se line of 420-ac tr, Henry Foster sur 34, top Austin chalk, 291 ft, top Eagleford, 485 ft, top Buda 506 ft, top Del Rio 541 ft, top Georgetown 580 ft, top Edwards lime 615 ft, top Glenrose 1049 ft, top Trinity 1868 ft, abnd 2350 ft, may drill deeper later.

Edwards County—O. C. Reynolds' Turney 1, 150 ft s line, 150 ft w line of 160-ac lse, sec 165, CCSD and RGNG sur blk A., sand, oil show 412-15 ft, comp estimated 1 barrel per day on pump, shot with nitro, td 415 ft.

Guadalupe County — Tidewater Associated Oil Co.'s Jackson 1, 230 ft sw line, 1650 ft nw line of 125-ac tr, J. G. Blair sur 422, top Austin chalk, 2460 ft, top Edwards 2765 ft, abnd at 2810 ft.

McMullen County—Edwin M. Jones' Ezzell 95, 990 ft s line, 990 ft w line of sw¼ of sec 10, Ezzell Ranch subd, Patrick Faddin sur, abnd at 1628 ft. C. C. Schumway and C. H. Burns' Shiner Estate 5, 330 ft s line, 330 ft e line of w½ of s½ of blk 1, C. C. Shumway subd, Shiner Ranch, top Ezzell 1443 ft, sand 1443-51 ft, abnd 1535 ft.

Nueces County — SEW Oil Corp.'s Dallas Bank 1, 660 ft ne line, 660 ft nw line sec 148, Bishop subd of Weil ranch, Palo Alto gr, sands, no show 4556-64 ft and 4762-67 ft, abnd 6585 ft.

Val Verde County—H. N. Prince and P. G. Powell's Harrison 1, 449 varas e line, 343 varas south line of sec 20, GC&SF sur, blk L, sand lime 400-25 ft, comp est 3 bbls per day, 24 gr oil, large vol. fresh wtr on pump, after acidizing with 750 gals water apparently fr old well 200 ft away, td 425 ft.

Victoria County—Oliver Oil Co. and Renwar Oil Corp.'s Johnston 1, 520 ft w line, 444 ft s line of 65-ac tr, blk 14, P. M. Johnston subd to Bloomington townsite, Francisca Perez sur, sand with oil odor 5550-5610 ft and top salt water sand 5730 ft, abnd 6018 ft.

Webb County—H. K. Boysen and Brian Jones' Watkins 2, 330 ft n line, 2970 ft e line of sec 20, San Casimiro gr, abnd 1406 ft.

TEXAS GULF COAST

FIRST REPORTS

Chambers County — Jack Frazier's Tyrell Trust 1, ne of Seabreeze, 1400 ft fr s line and 900 ft fr e line of H. & T. B. No. 97, lcn.

Ft. Bend County—N. W. Hunter's Settegast 1, Clodine area, 530 ft fr n line and 410 ft fr e line of 20-ac tract of an 80-ac tract in E. P. Whithead sur, lcn.

Harris County—Coastal Dev. Co.'s Sweeny 1, Ogburn area, 1068 ft fr e line and 707 ft fr s line of 695-ac tract, J. C. Ogburn sur, dr below 6400 ft. Wilhite & Hood's Harris Co. Navigation District 1, 250 w of Holland Ave and 950 ft n of R.R. in E. T. Thomas sur, dk.

COMPLETIONS

Brazoria County—Rowan Drilling Co.'s Villven 1, Iowa Colony prospect, 466 ft s and e of nwc of 60-ac tract, H.&T.C. sur, topped Frio 6026 ft, salt water sand, abnd 6500 ft.

Ft. Bend County—Jack Frazier & O. S. Martin's Blakley 1, Clodine area, 2700 ft w of e line and 2000 ft n of s line, J. Fredrick sur, topped Cockfield 7400 ft, salt water sands in Yegua, dst 7920 ft showed mud, abnd 8308 ft.

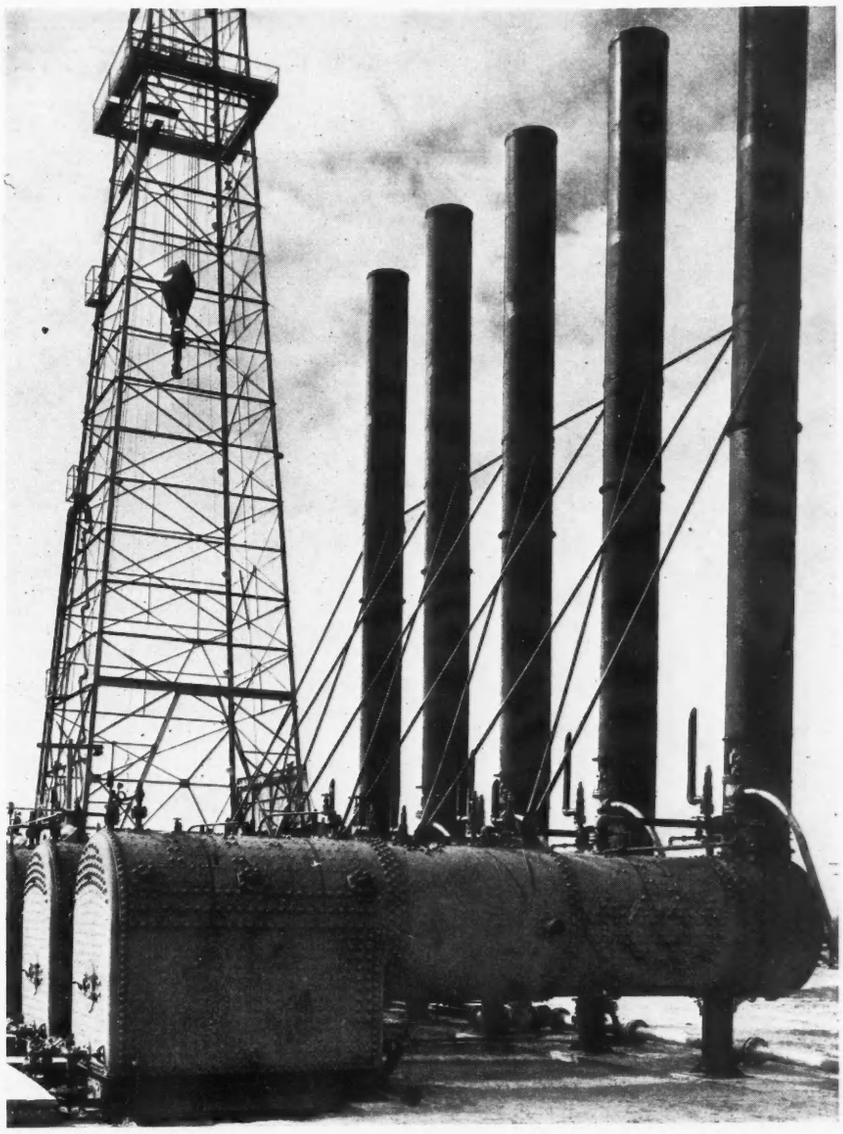
LETTERS

DEAR SIRS:

Having been interested in Michigan production for several years and having production in southwestern Michigan, I want to tell you that, in my opinion, your Mr. Lyon's article on the subject of Michigan production is the clearest and most interesting article I have yet read.

Will you be good enough to mail me ten (10) copies of THE OIL WEEKLY of July 17? Immediately upon receipt of an invoice covering this supply and their postage, I will forward my check.

F. SEARS, MCGRAW, JR.,
Independent Operator
Buffalo, New York.



Photograph of the boiler setting of the Superior Oil Company, Moody No. 1, in the Rio Bravo Field, California—500 lb. working pressure Broderick Super-Heated Boilers equipped with No. 40 California Type Sonner Burners.

***Because* SONNER BURNERS *are recognized as the most efficient burners today . . .* carrying 350% rating**

California Representative
ROBERT C. HOPKINS, 4409 Pepperwood Avenue, Long Beach, California, Telephone 4-5874

Why are

SONNER BURNERS

used in this setting of the

HIGHEST PRESSURE OIL FIELD BOILERS

in the World?

SONNER BURNERS *may be purchased at any Leading Supply Company. Write, wire or phone us for additional information.*

Export Distributors: The OIL WELL SUPPLY COMPANY

THE SONNER BURNER CO.

WINFIELD, KANSAS

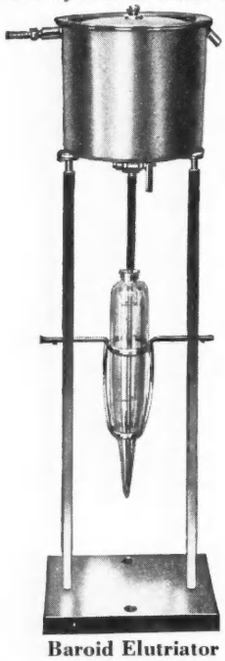
SEE COMPOSITE CATALOG OF OIL FIELD EQUIPMENT, PAGE 2065. ALSO DRILLING EQUIPMENT DIRECTORY, SECTION Q, PAGE 17.

NOTES FOR THE Equipment Buyer and User

Elutriator

BAROID SALES DEPARTMENT, NATIONAL LEAD COMPANY

A new A.P.I.-approved elutriator for determining the percentage of abrasive sand entrained in drilling mud has been announced by Baroid Sales Department of National Lead Company. Most novel feature of the elutriator is the constant-head effect obtained by equipping the reservoir with inflow and overflow tubes. This effect is particularly essential for muds that are partially flocculated, since they require a great deal of washing before the clay and sand separation is achieved. The elutriator depends upon the suspensory capacity of water moving at a fixed rate. Colloidal material is removed from the mud, while abrasive sand larger than 200 mesh size is retained in the glass tube, where its percentage by volume is read directly from an etched scale. With the exception of the rubber jet tube connection and the elutriation tube the instrument is constructed entirely of Duralumin with rustproof finish. Manufacturers claim complete rigidity and portability.

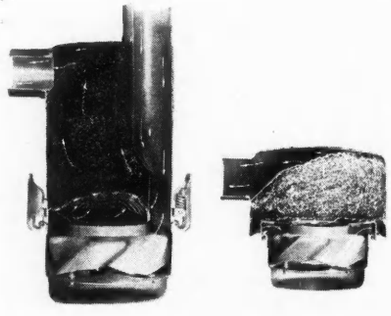


Baroid Elutriator

Oil-Bath Air Cleaner

VORTOX MANUFACTURING COMPANY

An oil-bath air cleaner for small and medium sized equipment announced by Vortox Manufacturing Company, Claremont, California, is made in two types, Type R and Type S, in both of which the air is made to whirl rapidly as it enters the cleaner, producing a vortex action picking up oil from the oil reservoir, spraying it on the impingement surfaces of the vortex chamber, and into the filter element, thoroughly washing it of dust. Thus, air is first subjected to the cleaning action of a vigorous oil spray and a strong centrifugal action before it can enter the filter for final cleaning. Oil drains from the filter element carrying the small amount of dust entrapped there down into the oil reservoir.



Vortox Air Cleaners

The air inlets of these two new type cleaners are submerged in oil, increasing the vortex action at low air flows. Oil is carried into the filter element by the first revolutions of the engine.

The principal difference between the Type R and Type S cleaners is that the Type R takes air in through a vertical inlet stack while the Type S admits air over the edge of the cup. Under conditions where it is desirable to extend the inlet of the air cleaner to reduce the dust load or where chaff or fibrous materials are encountered, the Type R is recommended. A feature of the Type R is a removable prefilter at the entrance to the filter element. This prefilter stops chaff, fibers, etc., and is easily cleaned. For general operating conditions, the Type S should be specified.

Gas Indicator

E. D. BULLARD COMPANY

E. D. Bullard Company, 275 Eighth Street, San Francisco, announces its appointment as distributor for the new J-W Combustible Gas Indicator for detecting and measuring any combustible gas or vapor. Improvements made in the construction of this device increase its convenience in use. It weighs only 6¼ pounds complete and the container measures 3¼ x 7¾ x 6 inches, making it exceptionally compact.

The sample to be tested is drawn through the indicator by the aspirator bulb. Concentraion of gas or vapor is shown immediately by the indicator meter in terms of that characteristic common to all combustible gases—explosibility.

A separate voltmeter, instead of a double-purpose meter, avoids hazard to reliability and accuracy. The J-W patented filament unit gives complete ambient temperature compensation and makes readings accurate and stable from the instant the current is turned on. The patented flame-arresting system is safe against any gas-air mixture and yet allows sample to be drawn as fast as the aspirator bulb can be pressed.

Heavy-Duty Welding And Heating Blowpipe

THE LINDE AIR PRODUCTS COMPANY

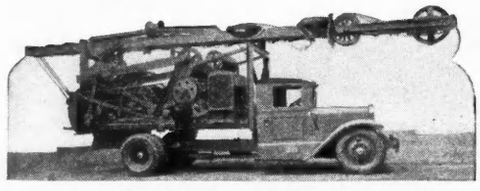
Literally hundreds of such metal-working operations as forging, forming, straightening, bending, and pressing can be effectively and economically performed with the aid of the intense, localized heat of the oxy-acetylene flame. Of late, the usefulness of the oxy-acetylene flame for these "smithing" operations has been greatly increased by the availability of the large-capacity heating blowpipe. This blowpipe, distributed by The Linde Air Products Company and known as the Oxweld (Type W-26) Heavy-Duty Welding Blowpipe, is for welding and heating ranges above those which can be handled by the ordinary blowpipes. It delivers a tremendous amount of heat to a localized area, and does this so quickly that metal-working and heat-treating can be accomplished at top speed.

Extensions for the welding head are

STEP UP YOUR DRILLING—

The answer to present day demands for increased speed and economy in drilling is — The Keystone All-Steel Spudder! Write for latest descriptive literature and field records!

TRADE MARK KEYSTONE REGISTERED U.S. PATENT OFFICE

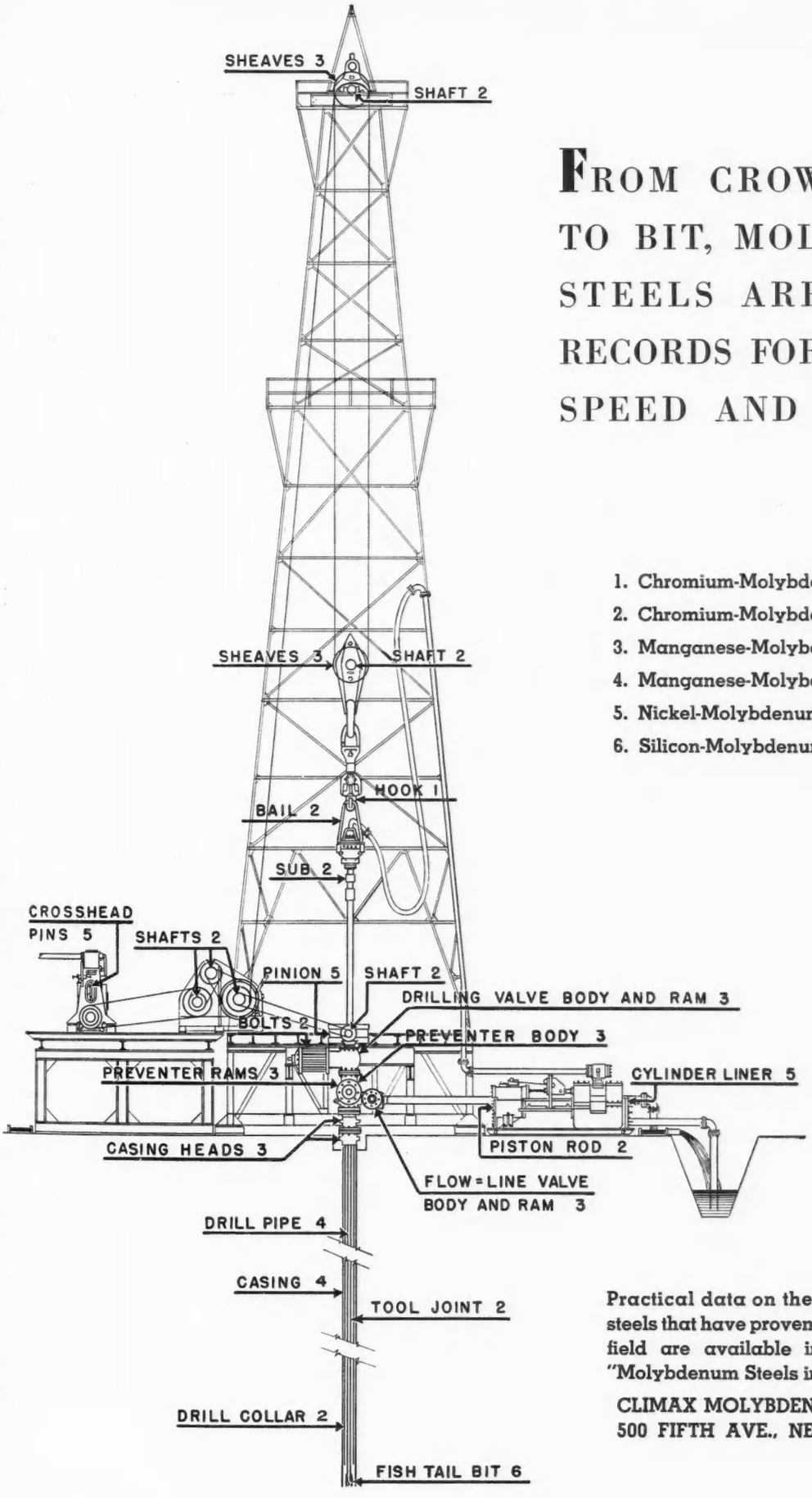


Time tested . . . Field proven

KEYSTONE DRILLER CO.

BEAVER FALLS, PA.

Joplin, Mo. Waukegan, Ill. Arlington, N. J.



FROM CROWN BLOCK TO BIT, MOLYBDENUM STEELS ARE MAKING RECORDS FOR DRILLING SPEED AND ECONOMY

1. Chromium-Molybdenum (Cast)
2. Chromium-Molybdenum (SAE 4140)
3. Manganese-Molybdenum (Cast)
4. Manganese-Molybdenum (Wrought)
5. Nickel-Molybdenum (SAE 4600)
6. Silicon-Molybdenum (Wrought)

Practical data on these Molybdenum steels that have proven themselves in the field are available in our free book "Molybdenum Steels in Oil Production."

CLIMAX MOLYBDENUM COMPANY
500 FIFTH AVE., NEW YORK CITY

MECHANICAL RUBBER GOODS AND SYNTHETIC OIL-RESISTING PRODUCTS

Our modern facilities, factory trained men, and strict supervision of all work assures Oil Field Equipment Manufacturers of highest quality and efficient service.

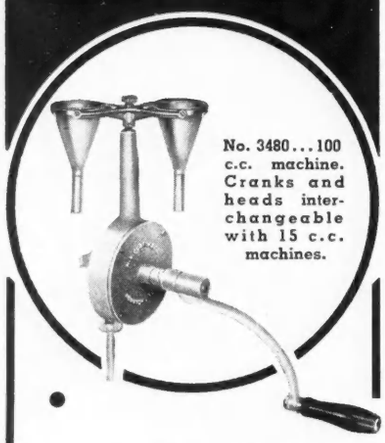
We cordially invite our friends and customers to visit us in our new home.

MURRAY RUBBER COMPANY

606-8 N. Milby Preston 7071

HOUSTON, TEXAS

GET ACCURATE RESULTS Quickly . . Easily . . with CURTIN CENTRIFUGES



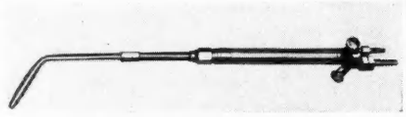
No. 3480...100 c.c. machine. Cranks and heads interchangeable with 15 c.c. machines.

You can maintain your required speed for the period of the test with much less effort. Curtin Centrifuges, proven world-wide, are heavy duty, rigidly constructed, and extremely simple in design. Illustrated bulletin, giving full details, available upon request.

W·H·CURTIN & CO. Inc.

HOUSTON U·S·A TEXAS

NOTES FOR THE Equipment Buyer and User



Oxweld (Type W-26) Blowpipe for heavy-duty welding and heating operations.

available for extra-heavy work, doing away with the necessity for heat shields. The operator works in comfort, away from the source of heat, and finds the blowpipe, even with the extension, easy to handle because of its excellent balance.

Its applications cover a wide range, including use in the fabrication of tanks and pressure vessels, for making locomotive boilers, for straightening and bending ship plate, for wrinkle-bending large-diameter pipe, and for similar heavy work. It can also be used for lighter work as well as for certain flame-hardening operations.

Rubber Insulated Power Cable

Anaconda Wire & Cable Company, 25 Broadway, New York City, has available a new catalog covering Rubber Insulated Power Cables. Not only are all physical and electrical characteristics given for all types of rubber insulated power cables but a complete section on coding details of control cables, as well as a comprehensive section on technical data, including new tables on current carrying capacity and other information.

Piping Handbook Revised

The third edition of "Piping Handbook," an 897-page volume revised in the spring of 1939, is ready for distribution. The authors, J. H. Walker and Sabin Crocker, point out that the purpose of the handbook is to provide authoritative and accessible data for the engineer interested in piping design. That the need existed for such a book was attested by the interest accorded the first and second editions.

Many sources have been drawn upon freely with the idea of assembling and coordinating all appropriate material, and no claim of originality is made by the authors. The significant changes in piping practices during the eight years since the first edition appeared made imperative a thorough rewriting of the handbook in bringing out the third edition.

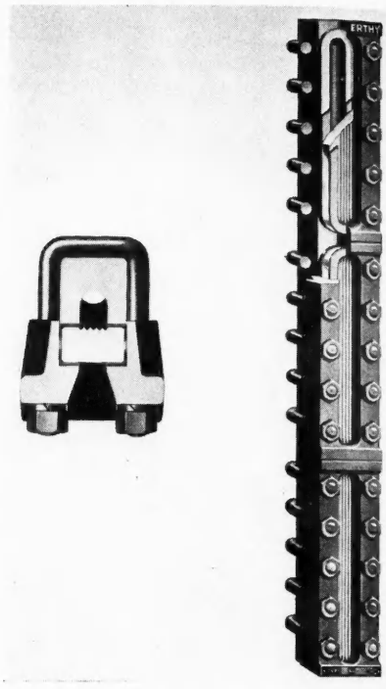
During the intervening years since 1930, welded joints have come into their own; readymade welding fittings have been invented and have gone into quantity production and use; welding-end valves have been developed and adopted; super-heated steam temperatures have been advanced from 750 to 950° F., and suitable weldable alloy steels for increased temperatures have been developed; new methods of pipe manufacture have been introduced; and general piping requirements have radically changed.

The book may be obtained from Gulf Publishing Company, Houston, Texas, at $6.00 per copy.

Liquid Level Gauges

PENBERTHY INJECTOR COMPANY

A new series of drop-forged steel reflex liquid-level gauges has been introduced by Penberthy Injector Company, Detroit, Michigan. Salient features of construction are the gasket



Penberthy Liquid-Level Gauge

gland, which is machined integral with the liquid chamber to forestall gasket blowouts, a frame of drop-forged alloy temperature-resisting steel, and the use of pyrex glass. The gauges are made in two types: Type "S" is recommended for 1500 pounds at 100° F. and 500 pounds at 1000° F.; Type "V" is recommended for 3000 pounds at 100° F. and 1000 pounds at 1000°. Gauges can be furnished in any desired length by increasing the number of sections.

One-Hand Fire Extinguisher

Walter Kidde & Company, 140 Cedar Street, New York, announces the new Kidde-LUX portable carbon dioxide two-pound fire extinguisher. This unit features a pistol-grip handle with trigger-control valve and self-locking horn. Highly efficient discharge of carbon dioxide without waste directly on a fire is provided by finger-tip control and balanced one-hand operation. Bulletin BD-498 which fully describes this new device is offered free by the manufacturer.

Wire Rope

Macwhyte Company, Kenosha, Wisconsin, is mailing a booklet "Life Hangs By A Thread" to explain the steps in the fabrication of wire rope, and point out the necessity for careful design and craftmanship in building a superior product.

NOTES FOR THE Equipment Buyer and User

Parkersburg Rig & Reel Company Absorbs Smith Separators

The Parkersburg Rig & Reel Company which heretofore has been acting as exclusive distributor of products of Smith Separator Corporation of Tulsa, Oklahoma, recently announced that it has absorbed all rights to and interests in the Smith Separator and other products manufactured by Smith Separator Corporation. Further plans call for Parkersburg to continue manufacturing its newly acquired line in Tulsa and to market it under the trade name of "Parkersburg-Smith."

As announced elsewhere in this issue of THE OIL WEEKLY, R. S. McKeever, E. H. Ross and J. H. Smyth have accepted positions with The Parkersburg Rig & Reel Company and will be active in the selling and designing of Parkersburg-Smith Separators. McKeever was formerly president of Smith Separator Corporation and Ross and Smyth were engaged in selling and engineering work respectively.

Link-Belt Announces Indianapolis Promotion

Announcement is made by Link-Belt Company that Frank S. O'Neil has been appointed general manager of the company's plants in Indianapolis, of which he had been assistant general manager for the last 7 years.

O'Neil joined the Link-Belt organization 33 years ago at the company's Chicago plant, where he worked 10 years in the foundry, machine shop, cost department, and rate setting and production departments. His Indianapolis plant experience dates back to 1916, the year in which he was transferred there from Chicago.

While at Indianapolis, he successively served as assistant superintendent in charge of malleable iron chain assembly, superintendent of the Ewart plant, and assistant general manager of both Ewart and Dodge plants.

Union Wire Rope Appoints Four New Mexico Distributors

Union Wire Rope Corporation has announced the recent establishment of distributors at four points in New Mexico; The Meyers Company at Las Cruces and Roswell; the Tucumcari Lumber Company, at Tucumcari; and Hollomon Brothers, at Alamogordo. George N. LeRoux, 1317 Randolph St., El Paso, Texas, is the company's district representative in charge of this territory.

J. E. Smith Promoted By Gas Lift Corporation

J. E. Smith has recently been promoted by Gas Lift Corporation to district manager, in charge of sales and engineering, for the East Texas and Rodessa areas. Smith spent a number of years in gas-lift work in these districts prior to being transferred to the sales department in the Gulf Coast area.

J. E. SMITH
East Texas District Manager, Gas Lift Corporation

Gillespie Assistant to President Of Wilson Welder and Metals

Air Reduction Sales Company, 60 East 42nd Street, New York, announces the appointment of J. T. Gillespie, Jr., as assistant to Thomas B. Hasler, president of Wilson Welder and Metals Company, an affiliate.

Gillespie, whose headquarters will now be in New York, was formerly assistant manager of the central division of railroad sales of Air Reduction Sales Company in Chicago, and in his new duties will handle promotional sales activities in cooperation with I. B. Yates, general sales manager of Wilson Welder and Metals Company.

Oliver H. Van Horn Company to Distribute Smith Equipment

Smith Welding Equipment Corporation, Minneapolis, Minnesota, announces the appointment of Oliver H. Van Horn Company of Houston as distributors of the Smith line of oxy-acetylene welding and cutting equipment, generators, arc welders, and supplies. A complete stock has been placed in the Houston store.

Geochemical Service Corporation Installing Equipment at Tulsa

A new company has entered the field of geochemical survey work through the organization of Geochemical Service Corporation, Tulsa. Analytical and laboratory equipment is being installed at this time under direction of Dr.

REED'S 'B-R' DRILLING BIT WITH WIRE LINE RETRACTABLE CORE BARREL

HARD FORMATION HEAD (Interchangeable with Soft Formation Head)

REED 'B-R' Drill Collar and 3-Blade Drilling Bit with Core Barrel in position

REED ROLLER BIT CO.

Geosco

"Complete equipment for the Geophysicist"

The largest exclusive Geophysical house in the world. Call us for instant delivery, complete stocks carried in our Warehouse at all times.

•

24-Hour Service

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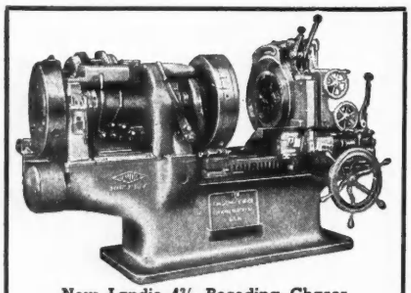
GEOPHYSICAL SUPPLY COMPANY

Local Phone—Preston 2456
Long Distance Phone—Fairfax 1819
Nights and Sunday Phone
Lehigh 5613

1311 Dallas Avenue

HOUSTON, TEXAS



New Landis 4¾ Receding Chaser Pipe Threading Machine

COMPLETE LINES

Machine Tools—Metal Working Machinery—Bolt and Pipe Threading Machines—Electric Arc Spot and Butt Welders—Hand Power and Electric Traveling Cranes—Foundry and Forge Shop Equipment.

D. S. MAIR
MACHINERY CORPORATION

HOUSTON
4000 Clay
Stanley Mair
Fx. 1466

DALLAS
322 Allen Bldg.
Chas. Harter
7-2874

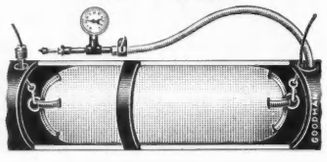
Standco
NO-SMOKE

STANDCO BRAKE LINING

for the easiest brake known. It "feeds off" evenly. Standco never scores brake rims. See page 2100 Composite Catalog.

Standco Brake Lining Co.
HOUSTON

STOPPERS FOR OIL LINES



Send for catalogue

SAFETY GAS MAIN STOPPER CO.
523 Atlantic Ave. Brooklyn, N.Y.

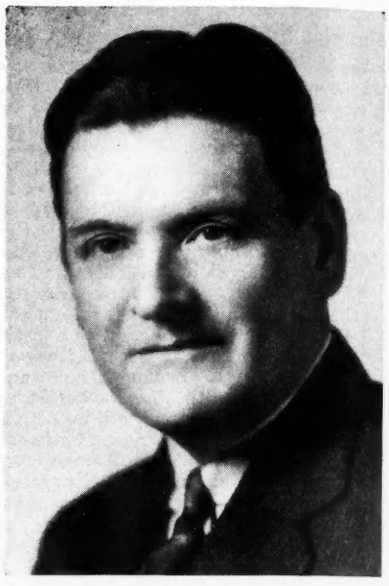
NOTES FOR THE Equipment Buyer and User

Sylvain J. Pirson, head of the Petroleum and Natural Gas Department, Pennsylvania State College, who will act as technical adviser to the new organization. Other officers are John W. Merritt, president; R. C. Earlougher executive vice president; L. M. Arnold, secretary-treasurer. The company has acquired space in conjunction with Geologic Standards Company's core analysis laboratory at the same address.

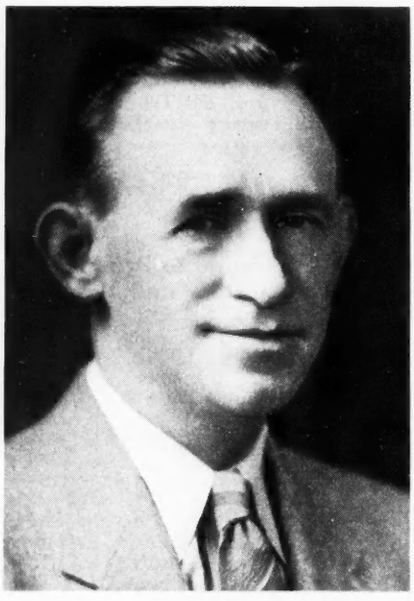
Assume New Duties With Parkersburg

R. S. McKeever, formerly president of the Smith Separator Corporation, of Tulsa, Oklahoma, and E. H. Ross, also formerly employed by the same company have joined The Parkersburg Rig & Reel Company and will be actively engaged in the selling of Parkersburg's newly acquired line of "Parkersburg-Smith Separators." Both McKeever and Ross will reside and work in Tulsa.

J. H. Smyth, formerly employed as an engineer by The Smith Separator Corporation, has also joined the Parkersburg organization and will reside in Tulsa and continue to be engaged in the designing of Parkersburg-Smith Separators.



R. S. McKEEVER



E. H. ROSS

The changes reported above took place following the absorption by The Parkersburg Rig & Reel Company of all rights to and interests in the Smith Separator and other products manufactured by the Smith Separator Corporation.

As stated elsewhere in this issue of THE OIL WEEKLY, Tulsa will continue to be the manufacturing point for Parkersburg-Smith Separators.

Dragon Company Representative Moves to Shreveport

Edward Ross, for sometime representative of The Dragon Manufacturing Company in the Southwest, whose headquarters have been at Tulsa, Oklahoma, has moved to Shreveport.

Arc Welding

Oil field equipment and machinery constitute subjects of original studies contained in the new book, "Arc Welding in Design, Manufacture and Construction," just published by The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio. These studies are contributions in the recent $200,000 Award Program. Altogether, the book contains 109 award papers. Feeling that the award papers constitute a large and valuable source of scientific study, research and information on welding, the trustees decided to make the material generally available.

"Arc Welding in Design, Manufacture and Construction" provides scientific and technical schools, engineering bodies and libraries, as well as industrial executives and officials, data on

Save Time, Work, Money

with a Simplex 310-A Emergency Jack!

They get you out of the hole every time. Best in any emergency.
Lifts 4-ways — on HEAD, toe, cap-hook and chain (as a sling). Operates vertically or horizontally. Pivoted base for shoving, etc.
Double socket for close quarter operation. Easily and quickly lifts more than its rated capacity of 15 tons.
New bulletin, Oil-39, shows many types of oil field jacks, field boiler supports, pull rod jacks, etc.
Stocked by your field store.

TEMPLETON, KENLY & CO., Chicago, Ill.
Better, Safer Jacks Since 1899

SIMPLEX
GOLD MEDAL AWARD SAFETY JACKS

welding. The book will also be of value to designers, engineers, production officials and others desirous of obtaining the benefits attributed to arc welded construction.

With few exceptions, the papers are reproduced in complete form. Only those which were too lengthy for inclusion in their entirety are in the form of comprehensive briefs. All photographs and drawings essential to a clear and adequate presentation of each subject are included. Each study includes designs, calculations, procedures and other pertinent information showing how the advantages attributed to arc welded construction are obtained.

The book is priced at $1.50 per copy, postpaid in the United States, $2.00 elsewhere. Copies may be secured by writing The James F. Lincoln Arc Welding Foundation, P. O. Box 5728, Cleveland, Ohio.

Manganese Steel

American Manganese Steel Division, Chicago Heights, Illinois, has issued a new 64-page catalog which contains over 400 illustrations showing manganese steel castings for every industry using equipment, the parts of which are exposed to impact and abrasion.

An introductory section asks the question, "What is Manganese Steel?"; then proceeds to answer it covering origin, physical properties, etc. Information follows on plant and research facilities and method of manufacture, concluding with many pages illustrating uses.

National Supply Company Literature

National Supply Company, Toledo, Ohio, has released Bulletin No. 239 on "Superior" stationary Diesel engines. Fifteen pages are devoted to description and illustration of Diesel engines and power units.

Stationary Compressors

A new 16-page catalog has been announced by Schramm Inc., West Chester, Pa., which presents a complete line of "Utility" Stationary Air Compressors for industrial application. Sizes from 85 to 600 cubic feet capacity are listed in an assortment of assemblies ranging from a bare compressor unit to complete air plants with electric motor, air receiver and all fittings, ready for operation. Either "V" belt drive or a compact "built-in" direct motor drive can be furnished. Operating data, detailed specifications and pictorial design features are included. Ask for Bulletin 3907-OW.

Laminated Shims

Laminated Shim Company 21-86 Forty-fourth Avenue, Long Island City, New York, has issued an application chart which is a comprehensive survey of applications for laminated shims or shim stock, generously illustrated.

Gas Recycling

Clark Bros. Company, Olean, New York recently published a handsome booklet telling the complete story of gas recycling and repressuring and distillate recovery. Copies of the booklet may be secured by writing to the company.

Announcing

HORNKEM

The balanced mud treatment. Reduces viscosity and gel strength of drilling muds.

HORNKEM No. 41

in liquid and powder form:

1. Is stable, therefore economical
2. Does not overtreat, therefore safe
3. Will not weaken cement
4. Is well balanced, therefore widely applicable

HORNKEM No. 88

in powder form:

1. Corrects the pH of both, too alkaline and too acid solutions
2. Brings overtreated muds back to normal so that they again respond to chemical treatment

HORNKEM No. 99

in powder form:

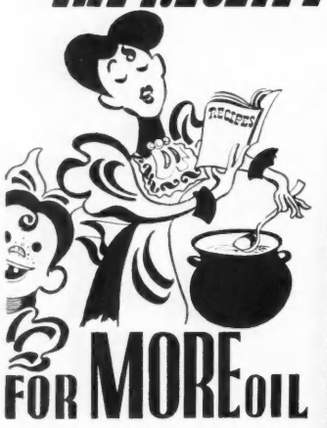
Offsets the gelling effect of salt water

A. C. HORN COMPANY

Chemical Division

New York Houston Los Angeles

MILLER'S
THE RECEIPT



FOR MORE OIL

And MILLER Sand Pumps are being used *EVERY DAY* throughout the World to clean-out sand and sediment clogged wells—*INCREASING PRODUCTION.*

The MILLER is made in diameters of 2½, 3, 3½, 4, 4¼, 5, 5½, 7 and 9 inches and lengths of 20, 25 and 30 feet. 5/32-inch wall thickness in REGULAR Type. ¼-inch wall tubes HEAVY Type Sand Pumps.

INTERCHANGEABLE BOTTOMS
To Meet Every Condition

● BAILER BOTTOM
With the Bailer Bottom installed the MILLER is quickly changed to a Bailer giving you a combination of either Bailer or a Sand Pump in one tool.

● SAND BOTTOM
Used when tools are run and when well is shot to quickly remove loose material.

STAR BOTTOM
Used for cutting the sand loose.

● CHISEL BOTTOM
(In Pump)
With this bottom tightly packed sand can be easily broken in small pieces so it can be picked up in the pump.

Write for Descriptive Folder and Price List

See Pages 1564-65 COMPOSITE CATALOG

PATENTED
NO. 1370340
NO. 1523908
NO. 1707390
NO. 1862628
NO. 1866028
NO. 2055667

MILLER
Sand Pump Co.

General Offices and Factory:
OKLAHOMA CITY, OKLAHOMA
1524 S.E. 29th P.O. Box 4516 Tel. 7-6884

Branches:
SAPULPA Okla. Tel: 341
KILGORE Texas Tel: 545
HOUSTON Texas Tel: P-2841

FOR SALE BY SUPPLY STORES EVERYWHERE

Squeaks from the Bull Wheel

Unfair

"There is a lot of favoritism in our family."

"Why, Jack, what on earth do you mean?"

"Well, I get punished if I bite my fingernails and when baby puts his foot in his mouth they think it's cute."

More Scotch

"Mr. McPherson in?"

"Gorn to lunch, sir. The guv'nor always goes to lunch early. He doesn't have to eat so much as he would later on."

She Should

"Maria carries her age well, doesn't she?"

"She ought to. She has had long years of experience."

Spic and Span

"Have you cleaned the deck and polished the brasses?"

"Yes, sir, and I've swept the horizon with my telescope."

Just Once

"How often do big ships like this sink?"

"I think that once would be enough."

Bill Pigue's Letter to the Milk Man

Bill Pigue's letter to the milkman appeared on this page August 8, 1930. Bill since has passed to his reward, but his friends remember him and his humor. Often we have requests for copies of this letter from people who long since have worn out their clippings. So here it is again:

———— Dairy Co.

Gentlemen:

By referring to your records you will find that for several years I have been a pretty good customer of yours, and that I have paid my bills with reasonable promptness. It may interest you, therefore, to know that we are now approaching the parting of the ways—unless you can give me relief from a condition about which I have already complained, in writing, via wrapping-paper note in milk bottle to your driver.

At the time of my first complaint, I didn't have a pup, but now with the pup added to the otherwise almost unbearable complications, patience has ceased to be a virtue and tolerance but an empty word.

As I advised your driver, in writing, your milk-wagon horses have so synchronized their intestinal affairs with their scheduled arrival in front of my home that each and every morning of the year they deposit, in profuse abandon, souvenirs which might be of great value to a farmer or truck-gardener, but which are only something to worry about for the man who lives out of a sack.

For 50 feet directly in front of my door there is at this very minute unlimited evidence of my steady patronage of your good concern, and in the continued absence of rain I am liable at any time to be haled before the powers that be and tried for obstructing the traffic.

You may wonder, and you have a right to wonder, where and why the pup enters into this matter between you and me and your milk-wagon horses. In the words of that immortal poet, Chick Sale, I'll tell you why:

Ours is a trader pup, and we have treated him well. Full of gratitude, but having neither silver nor gold with which to show it, he renders unto us only that which he has—and all he has is the choicest collection of your horses' excellently-timed souvenirs, which he religiously deposits on the front porch each morning. Sometimes they sweep well, sometimes they do not.

Now, sirs, I don't know what you are going to do about this, but they're your horses. You may be able to use moral suasion, explaining to the horses that times are bad and business hard to get, and the customer is always right; that, however good their intentions may be, not all people like all things—and they should be less partial, passing their favors more generally over the neighborhood rather than upon a single family.

In my complaint to your driver I suggested that he stop his horses around the corner, or come some other route occasionally so that a horse with even the hardest intestinal fortitude may be overtaxed before he reaches my place, but my plea went unheard. At least there was no action—not on the part of the driver, I mean.

I am terribly serious about this, gentlemen. If you have any idea that I am suffering with the heat or something, that I have exaggerated by one jot or one tittle, I invite you to send an inspector out to 1106 Dormont before any great cloudburst hits us and take a look—not only a look at the street in front of my house, but if he is early enough, at my front porch. He may even interview the pup.

It is up to you. Unless I have relief commensurate with the relief which your horses have been enjoying for so many months that it really doesn't matter, my monthly checks will cease to clear through your bank.

Assuring you of my greatest respect, which, however, is not the least to be allowed to interfere with my great determination for succor, I am,

Yours cordially,
W. W. PIGUE

Anderson-Prichard Oil Corporation
Col-Tex Refining Company

Producers and Refiners

•

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AMERADA PETROLEUM CORPORATION

Beacon Building,

Tulsa, Oklahoma

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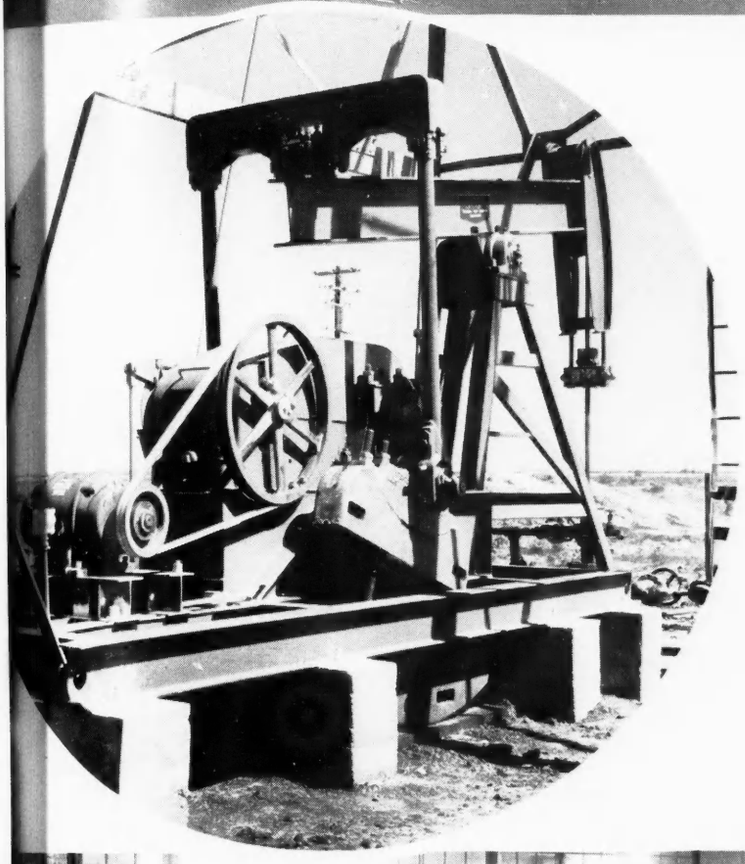
Performability!"



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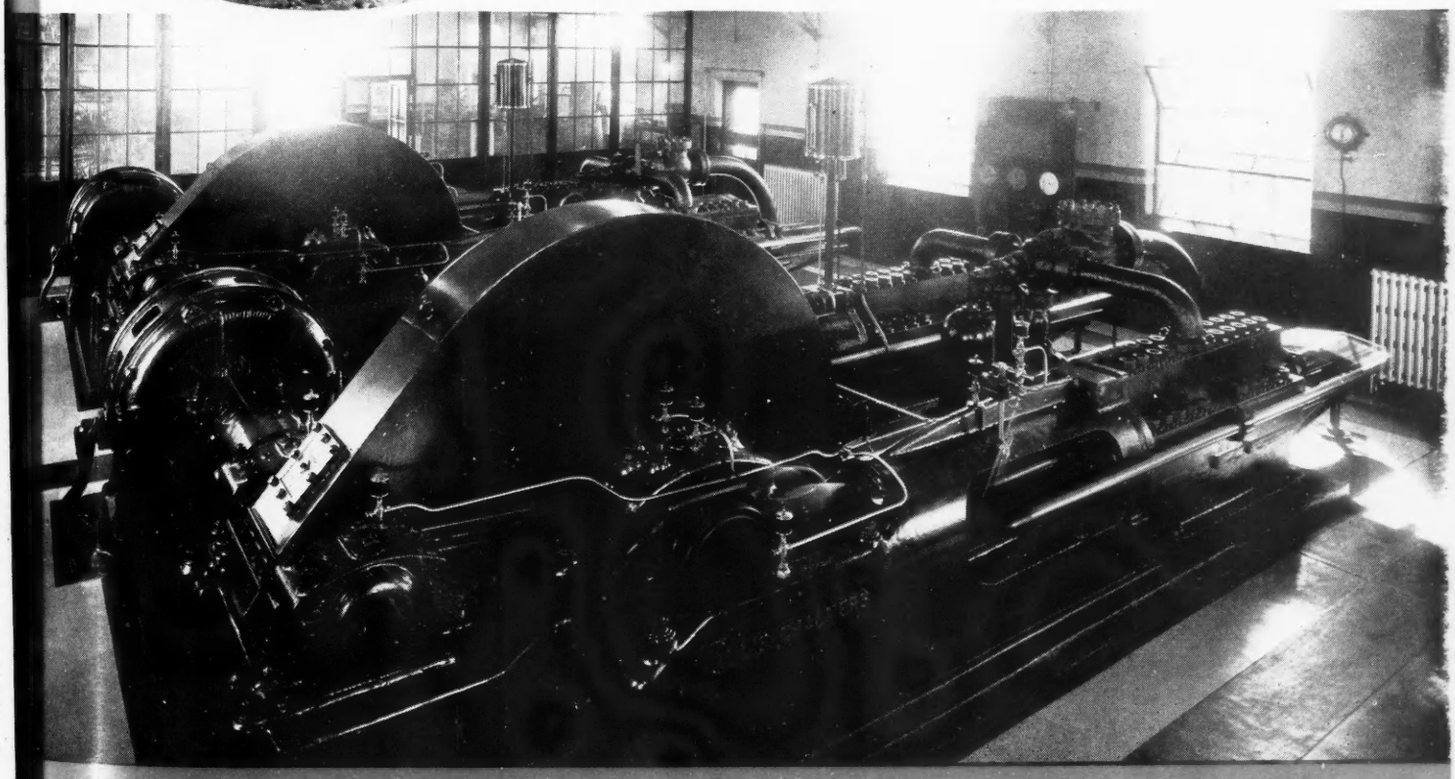
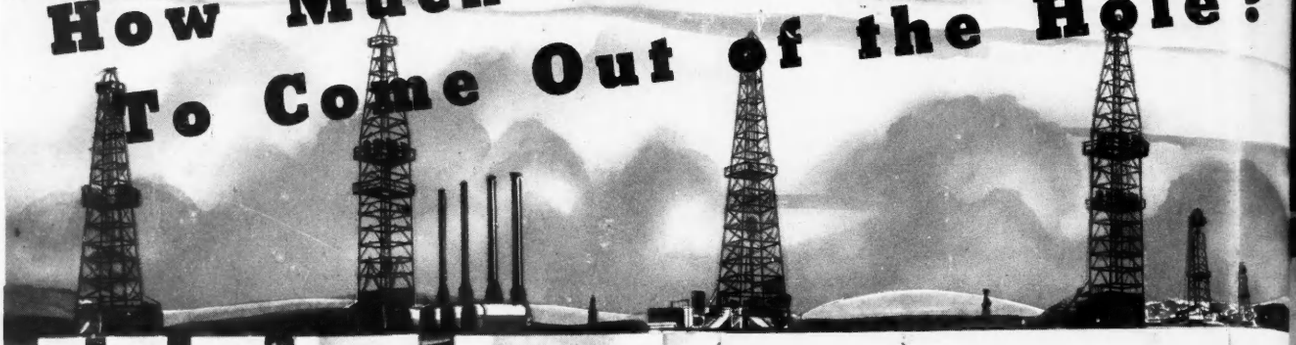
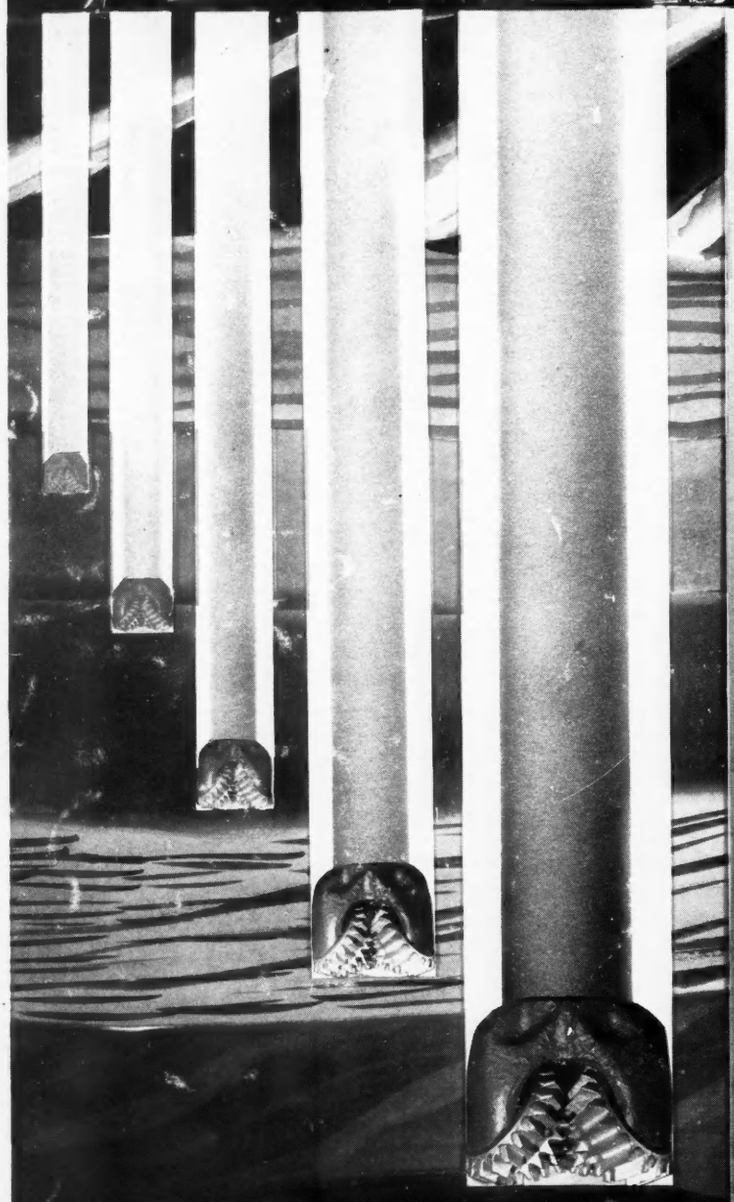


HOUSTON LIGHTING & POWER COMPANY

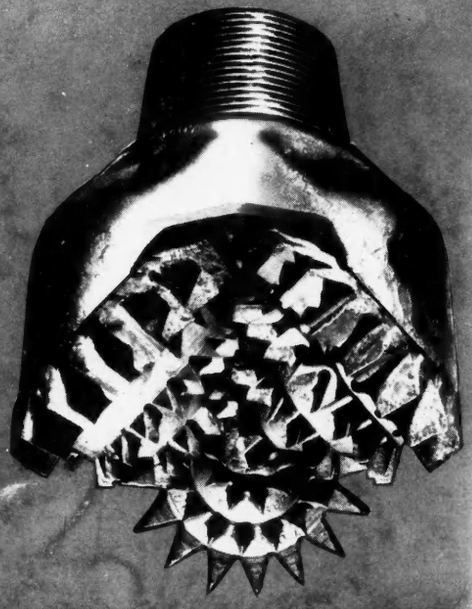
How Much Does It Cost To Come Out of the Hole?





• Everyone agrees that it costs plenty, and the deeper you are, the more it costs.

HUGHES ROCK BITS "save Round Trips" by making fast, straight, full gauged hole.



HUGHES TOOL COMPANY, HOUSTON, TEXAS

OIL WEEKLY

THE WEEK'S NEWS INTERPRETED

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The Moore RED HEAD

Moore

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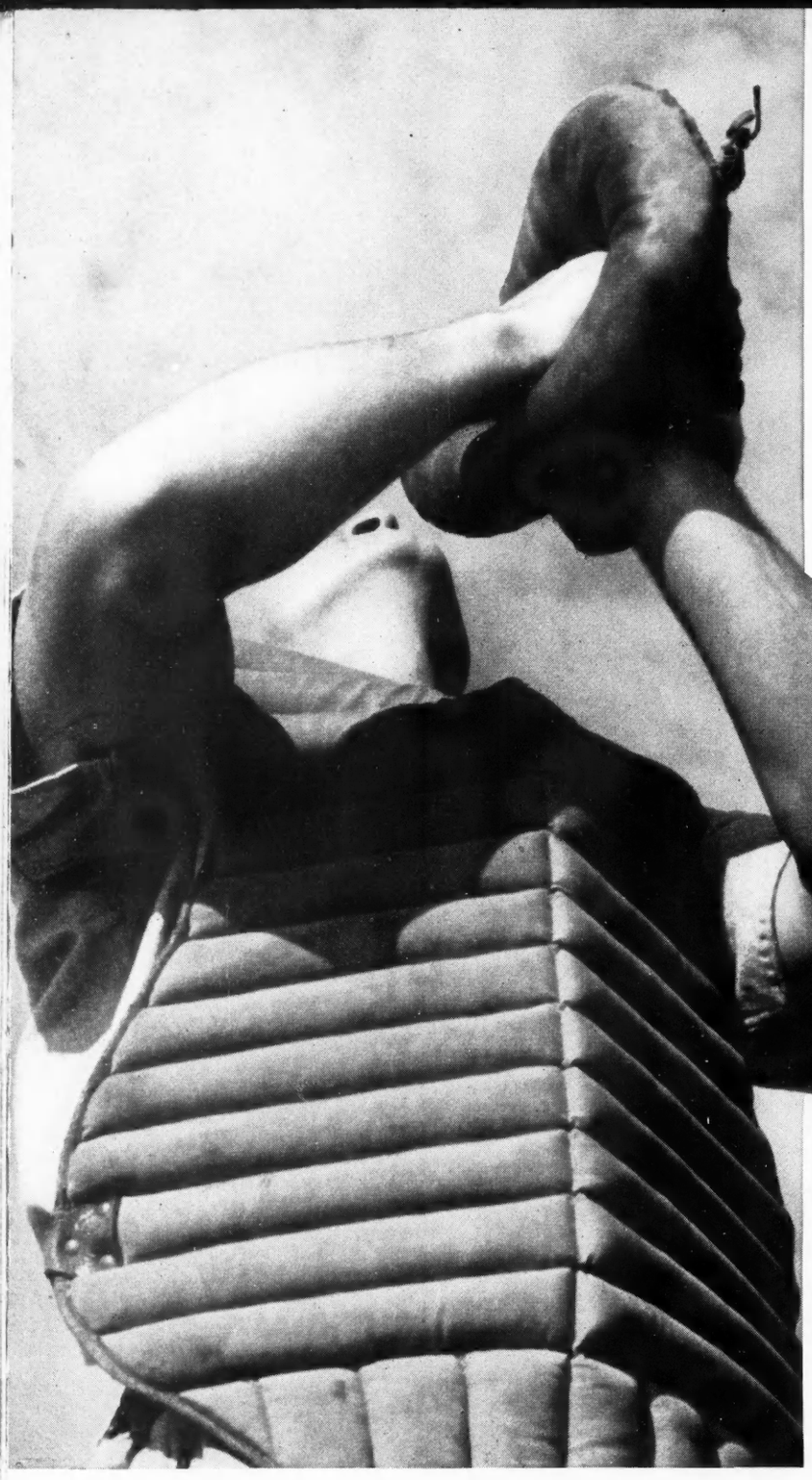
SERVICE FROM THE GROUND UP FOR THIRTY-ONE YEARS

AUGUST 7, 1939



MAKE IT STICK

POINTS TO REMEMBER ABOUT SQUEEZE JOBS

MAKE it stick—all important when it comes to squeeze jobs. It takes heavy slurries that stay put when the cement reaches the cavity . . . then get hard fast to give you a strong, dense, impervious shut-off. That says an Oil Man's cement—'Starcor'.

Heavy 'Starcor' slurries move easily through tubing, out into formation, closing channels formed by action of fluids. 'Starcor' is easy to handle . . . sets slowly at high temperatures . . . allows plenty of time, even when cement has to stand in the tubing . . . starts back in motion readily, with minimum pump pressures. Then, once in place 'Starcor' gains strength fast, gives you quick protection.

Use 'Starcor'* for reconditioning work and deep holes, high temperatures, extra sulphate resistance . . . 'Incor'* for wells of moderate depth . . . Lone Star for work above-ground. Portland cements, both—each the quality leader in its own field.

*Reg. U. S. Pat.

TWO PORTLAND CEMENTS—BOTH MADE FOR OIL WELLS

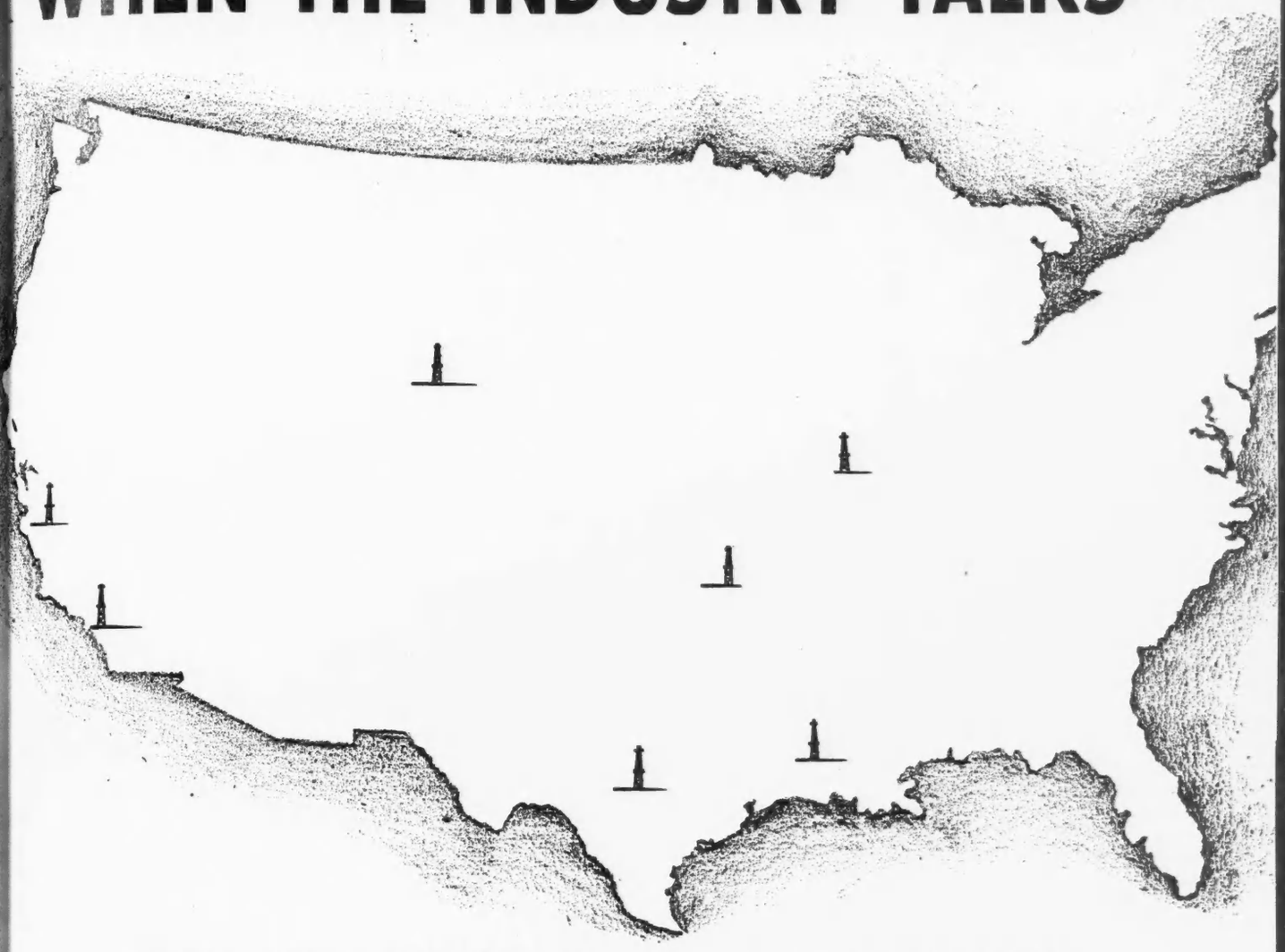
USE 'STARCOR'— for deep wells, high temperatures, extra sulphate resistance.

USE 'INCOR'— for wells of moderate depth, and low temperatures.

LONE STAR CEMENT CORPORATION

MAKERS OF LONE STAR CEMENT • 'INCOR' 24-HOUR CEMENT • 'STARCOR' CEMENT

WHEN THE INDUSTRY TALKS—



IT PAYS TO LISTEN

LOS ANGELES BASIN

"... Squeezing cement through shot perforations to cement off water entry from above and below a producing horizon, is only one of the successful applications we have found for the Baker Cement Retainer here in the Basin."

SAN JOAQUIN VALLEY

"... So we used a Cement Retainer to do a multiple batch squeeze job around the shoe ... water was coming in from above ... and we got a perfect shut-off."

ILLINOIS BASIN

"... Yes, and we also use it very successfully to perform squeeze jobs on casing leaks."

MID CONTINENT

"... We found that plugging back is no problem with the Baker Cement Retainer method."

LOUISIANA

"... Sure we had bottom water trouble on No. 2, but not after we did that squeeze job with a Baker Cement Retainer."

ROCKY MOUNTAIN TERRITORY

"... Of course you can use that Baker Cement Retainer for a Casing Bridge Plug ... and it makes a mighty efficient one, too."

TEXAS

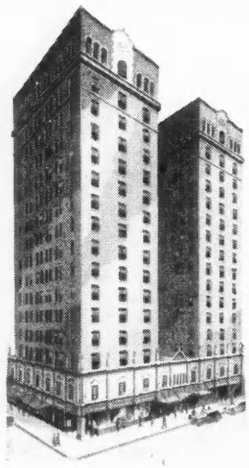
"... And by squeeze cementing we reduced the gas/oil ratio from 26,300:1 to 366:1 ... and the Baker Cement Retainer functioned perfectly."

COMPLETE DETAILS concerning the Baker Cement Retainer and its many important applications are given in Baker Broadcast No. 17-A. A copy of this comprehensive 40-page treatise will gladly be sent upon request.

BAKER OIL TOOLS INC., Box 71, Huntington Park, California

No Need to Wildcat!

The TEXAS STATE HOTEL Is a "Proven Area"



At HOUSTON'S oil headquarters there is no "Pro-ration" of smiling service.

When you stop at the TEXAS STATE you enjoy a convenient downtown location; quiet, cool, air-conditioned comfort; and good meals in the famous Silver Grill or Mezzanine Dining Room.

Completely Air-Conditioned

TEXAS STATE HOTEL
Houston

B. F. ORR **Gen'l Mgr.**

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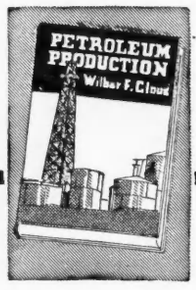

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A new book dealing with the fundamental operations and technical processes of oil production. It offers to the oil executive, the engineer, and the man in the field a most comprehensive treatment of the subject.

PETROLEUM PRODUCTION contains 613 pages of text, with 280 illustrations and 75 practical tables and charts. Price $5.00. Order your copy today from **Book Department.**

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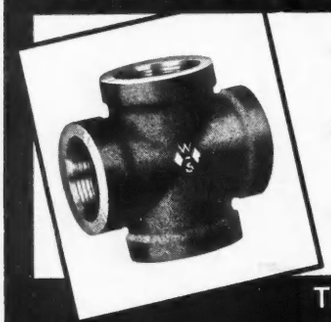
W-S FORGED STEEL FITTINGS



- ***On pipe lines carrying oil or gas at high pressures or temperatures, use W-S Forged Steel Fittings.***
- ***Having a uniform factor of safety, W-S Fittings can be relied on for longer and more dependable service.***
- ***Write for complete information or get in touch with your supply house.***

THE WATSON-STILLMAN COMPANY
ROSELLE, NEW JERSEY

LOOKING AHEAD

WITH THE EDITOR

Surface Cracks on Sucker Rods.

IF YOU are concerned with pumping, it is probable that a large part of your rod troubles are due to surface cracks.

What started the crack, and what can be done about it? These are questions you ask, knowing full well they could not be answered, in most cases, outside of a laboratory. And laboratory study of causes, effects and remedies generally is not talked of a great deal until the remedy is found.

Seldom is a reader invited behind the scenes in a manufacturer's laboratory while the problem is being solved, but an early issue of THE OIL WEEKLY will tell of such work on one new phase of surface cracks and bring the story up to discovery of the cause.

Some of the causes of surface cracks originate in the rod factory. That type you men in the field cannot prevent, but desire for continued business will cause the manufacturer's laboratory to see that something is done about them. Other types of cracks definitely are attributable to field practices, and you can prevent their occurrence, if you know how. An article that tells you how will be worth your while.

Such an article will appear as Pumping Series No. 17, so be on the lookout for it in an early issue of THE OIL WEEKLY.

Watch out also for one on how the men in Oklahoma City field are handling sand in that troublesome transition stage when a well wants neither to flow nor pump.

The OIL WEEKLY, Published every Monday. Entered as second-class mail matter December 23, 1916, at the post office at Houston, Texas, under act of March 3, 1879.

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Hydraulic Pump Co.
Jensen Bros. Mfg. Co.
Mid-Continent Supply Co.

PUMPS—Rotary:
The Guiberson Corp.
National Transit Pump & Machine Co. 51

PUMPS—Sand:
The Cavins Co.
Larkin & Co., Inc.
Larkin Packer Co.
Midco Tool & Supply Co.
Miller Sand Pump Co., Inc.
Shull Perforating Co.
Spang & Co.
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AMPLIFIERS . . . BUG BLOWERS . . . CHOPPERS . . . GUDGEONS . . . SPUDS . . . TOOL HOUSES . . . all these and thousands of other products are individually listed in this quick-finding, quick-reading index made up with the help of many oil companies and approved by them.

Whatever you want — and wherever you want it — your best bet to find it quickly and easily is in the . . .

1939

COMPOSITE CATALOG

DRILLING PROTECTION for 1/2c per foot

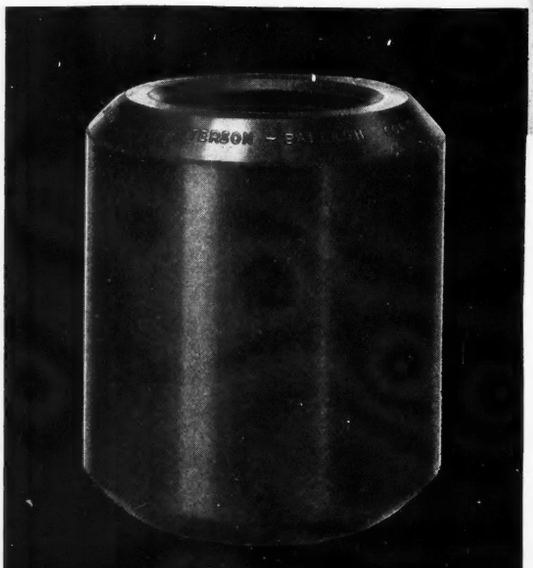
There's only one way to insure a well against

1. WORN-THIN CASING
2. EXCESSIVE PIPE VIBRATION
3. EXCESSIVE DRILL COLLAR WEAR

PATTERSON-BALLAGH

DRILL PIPE and CASING

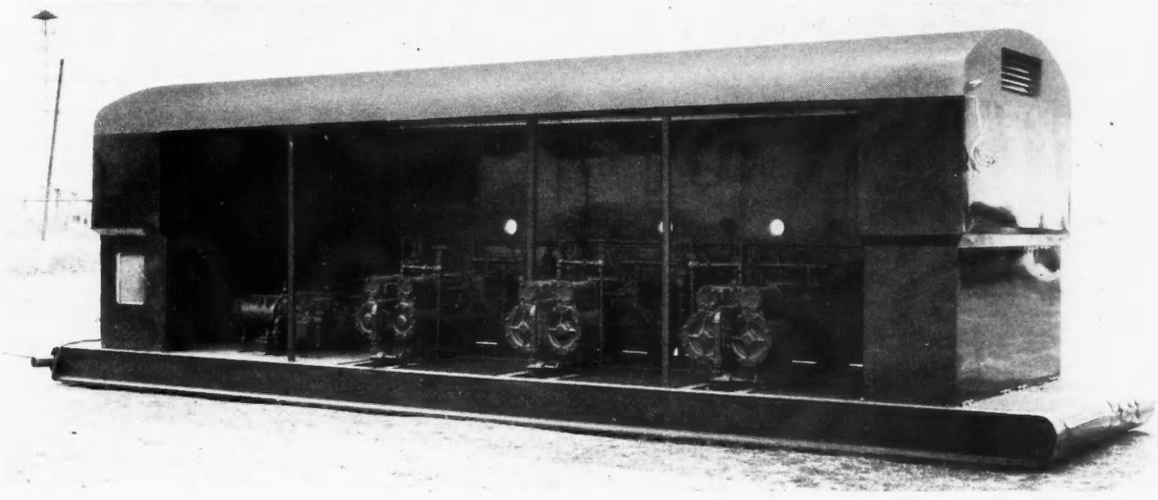
PROTECTORS



PATTERSON-BALLAGH CORP.

Plant and General Offices: 1900 E. 65th St., Los Angeles, Calif. Mid-Continent Office: 1506 Maury St., Houston, Texas. New York Office: 39 Cortlandt St., New York City.

Design for Efficiency ...and greater economy



Unit Designed by WEST PRODUCTION CO.

Housed and Unitized Boiler Feed Pumps and Lighting System facilitates moving . . . speeds setting-up!

This Wilson-Snyder Boiler Feed Unit consists of 3 Wilson-Snyder Boiler Feed Pumps; firing controls; Steam driven generator and auxiliary gasoline motor driven light plant all completely manifolded. The auxiliary light plant enables operator to set-up or tear-down rig after dark without benefit of steam supply.

All feed-water and steam lines are under the floor and can be connected from either end.

The unit can be moved complete, on its own foundation, by truck. It is necessary to make only electric light, steam and water line connections when moved to new location.

The dependability of Wilson-Snyder Pump performance, plus the ease of moving and speed of setting-up make this the most efficient and economical method of boiler feeding and lighting.

For complete construction details, communicate with

WILSON SUPPLY CO.

1412 MAURY ST. — **HOUSTON, TEXAS**

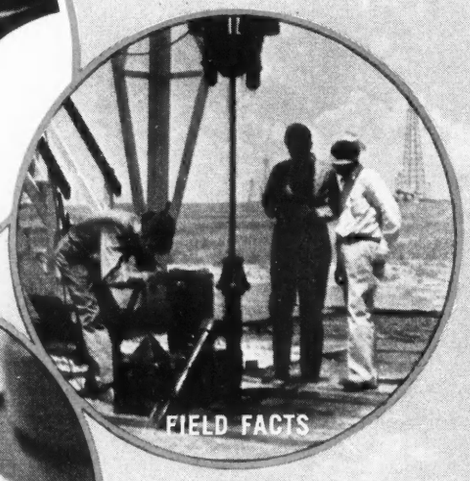
OIL & GAS WELL SUPPLIES

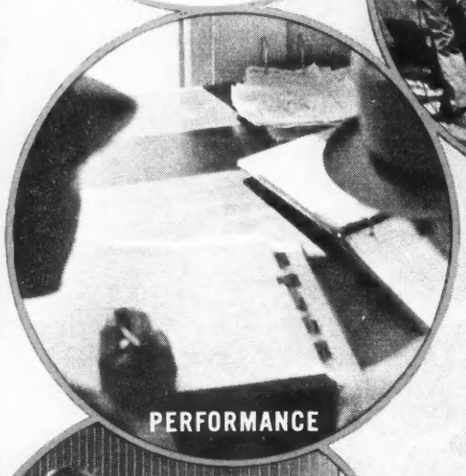
Complete line of FISHING TOOLS & SERVICE

EXCLUSIVE GULF COAST DISTRIBUTORS FOR: Wilson-Snyder Pumps; American Cable Tru-Lay Pre-formed Wire Rope; Kewanee Boilers; Sievers Reamers; Drift Meter, Jr.; Gray Swivel; Nixon Surface Control Gas Lift; Nixon True-Taper Slip and Spider; Bowen Pack-Off and Releasing Drill Pipe Overshot; Douglas Weight Indicator.

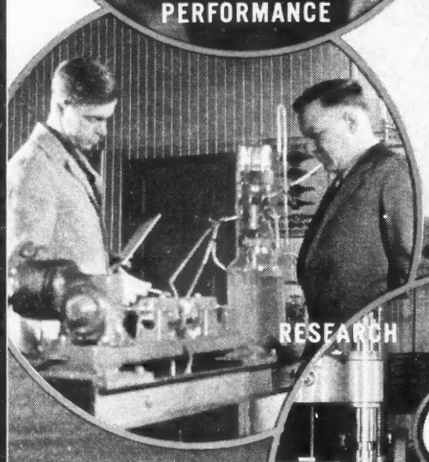
BRANCH STORES:
TEXAS: Gladewater; Barbers Hill; Bay City; Alice; Victoria; Corpus Christi; Benavides.
LOUISIANA: Rodessa; Lake Charles; New Iberia; Gretna; Shreveport.
ARKANSAS: Magnolia; Arkansas City.
SALES OFFICES — Tulsa, Oklahoma; Dallas, Texas.

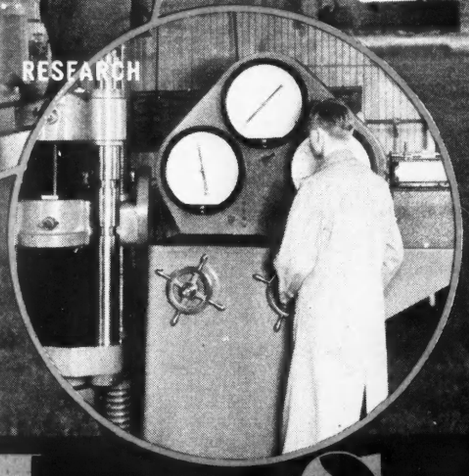
LOWER LIFTING COSTS grow where facts are the thickest





Reduce rod breaks with Jones Rods and Jones Service





● When you are faced with the choice between a Jones Sucker Rod and a cheaper rod, do this. Consider the facts in the case.

Fact No. 1—Pumping conditions get tougher as a well gets older.

Fact No. 2—The cheap rod that will get by today can't handle the corrosion and extra load that salt water encroachment brings.

Fact No. 3—Lifting costs are being lowered in practically every type of troublesome well in all the major fields through the combination of Jones Rods and Jones Service.

Fact No. 4—Take a well in the Panhandle, for example: Cheap rods were used. 29 failures occurred in 8 months. Facts about pumping conditions were gathered by a Jones Well Study. Jones Rods were installed and pumped for 226 days before first failure.

Come to an organization that has and can get facts about pumping conditions and knows how to use them—an organization that specializes 100% in sucker rods and sucker rod service.

A TYPE TO FIT EVERY PUMPING CONDITION

JoneSuckeRods

The S. M. Jones Company, General Office and Factory, Toledo, Ohio—General Sales Office, 518 McBirney Bldg., Tulsa
Southern Division Office, 806 Dallas National Bank Bldg., Dallas—Export Office, 19 Rector Street, New York City